

1948

PUBLIC WORKS

*city
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*october
1948*

OHIO STATE
UNIVERSITY
OCT 22 1948

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some of the articles
in this issue:

Advance Planning for
Public Works
Maj. Gen. Philip B. Flender

Line Treatment of
Concrete Paving

Sand Loader Speeds
Snow Removal

State and Local Planning

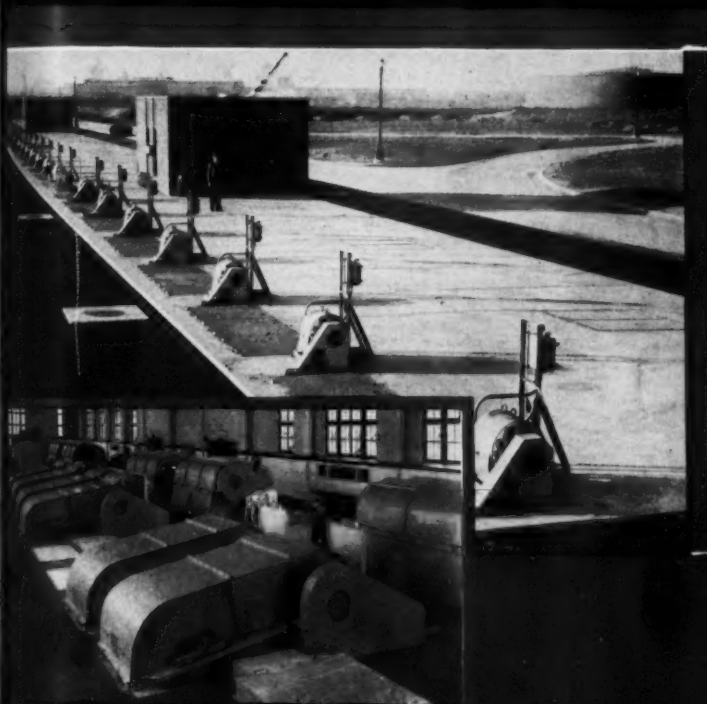
How to Design Sanitary
Sewers for a Small
Community

Stage Construction of
Aluminous Concrete
Highways

Effects of Low Temperature
on Trickling Filters

Saving with Electric Pumps

Public Works Monthly
Digests of Articles



You are invited

- to visit Booths 46-47
learn latest developments in sewage
treatment.
- to see Jeffrey equipment in actual
operation at the Detroit Sewage
Treatment Plant (note photos above).



THE JEFFREY MANUFACTURING CO.

90 NORTH FOURTH STREET

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UP GOES EFFICIENCY!

DOWN COME COSTS!

**WHEN YOU PUT
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**ROAD MACHINERY
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Huber's close contact with the users of road machinery reflects itself in the modern design, functional utility, and economical operation of Huber road machinery. The ability of Huber machinery to do your job adds greatly to the efficiency of your road building or maintenance operation.

Added to Huber's "job-ability" is their fine record for long trouble-free service—a point that really counts when it comes to cutting costs. Idle equipment is expensive equipment. With Huber your "downtime" will decrease regardless of your operating conditions.

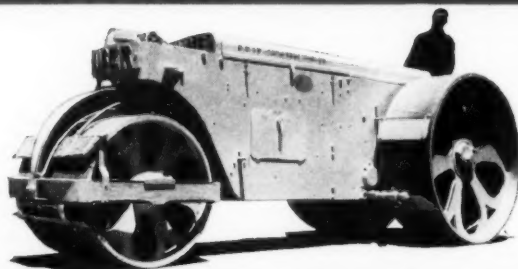
You'll be falling right in line with hundreds of experienced operators if you replace your present equipment with Huber road machinery. Where is there better proof of the many advantages of doing your job the Huber way than in this nationwide acceptance of Huber machinery? Write today for bulletins describing specific Huber machines.



Put the Huber Maintenance loader on any maintenance work. It's a real money-saver on a bulldozer, lift loader, back loader, grade roller, and many more.



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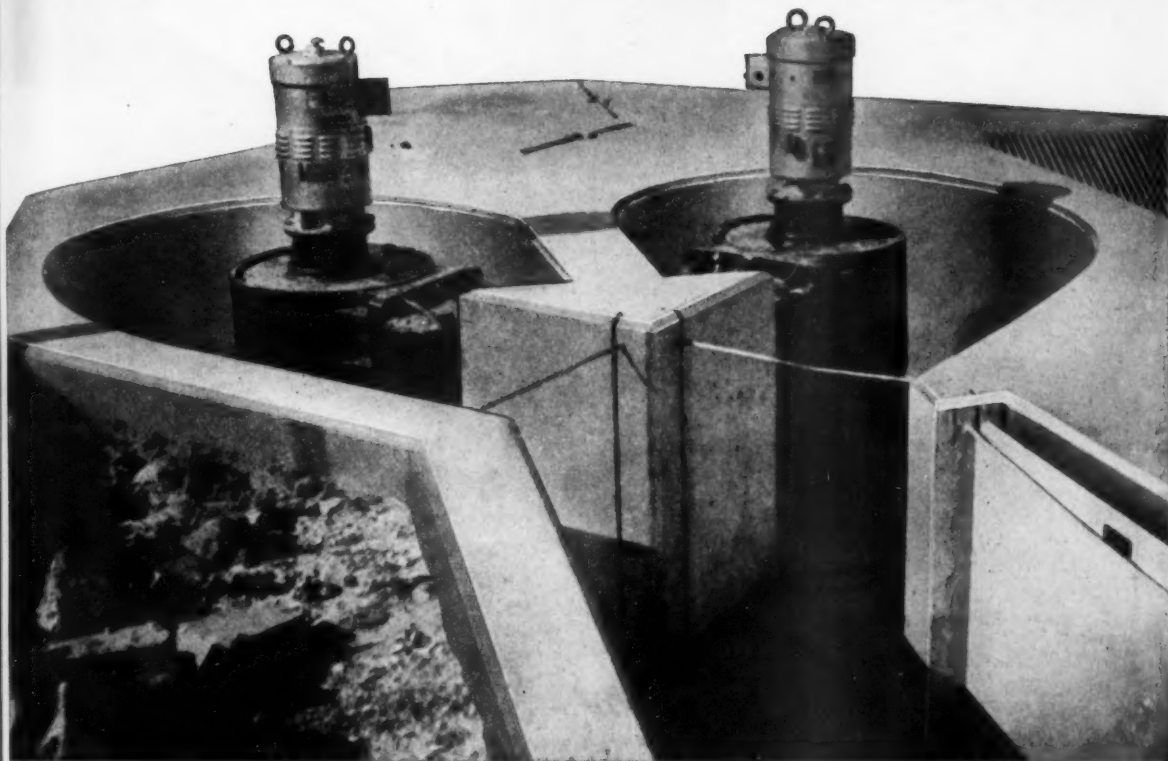
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Comminutors are Standard Equipment for Screening and Cutting Sewage Solids

Because-



- It cuts sewage solids into small particles that will pass through the drum slots.
- Scientifically designed and engineered — close tolerances insure shearing of rags and stringy material.
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CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

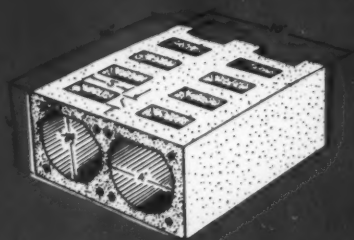
2348 WOLFRAM STREET

Flush-Kleen, Scru-Peller, Plunger,
Horizontal and Vertical Non-Clogs,
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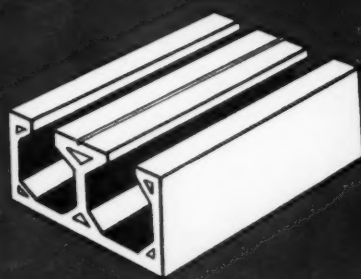


CHICAGO 18, ILLINOIS

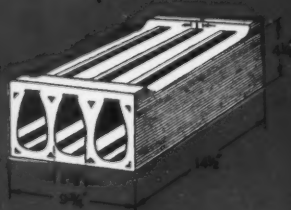
Swing Diffusers, Stationary Diffusers,
Mechanical Aerators, Combination
Aerator-Clarifiers, Comminutors.



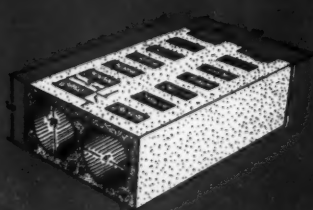
14" Armcre block made by Bowerston



Mono-unit type Metro filter floor system



Natco Unifilter Tile

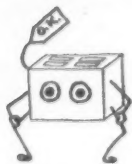


16" Armcre filter floor system

For Better Results from Trickling Filters

USE VITRIFIED CLAY FILTER BOTTOM BLOCKS MADE BY MEMBERS OF THE TRICKLING FILTER FLOOR INSTITUTE

Good Results from Trickling Filters Depend on Good Underdrainage



Uniform ventilation and adequate drainage are necessary to obtain best results from trickling filters. *Vitri-fied Clay Filter Bottom Blocks* made by the members of the

Trickling Filter Floor Institute are especially designed to provide the best possible underdrainage. These blocks are strong, light-weight and highly resistant to acids. Their smooth inner channels

insure maximum run-off without clogging. Large openings in the tops allow air to circulate freely through the filter media while carrying the sewage out, and they are easy to lay.

For lifetime, trouble-free service—and best results—always specify *Vitri-fied Clay Filter Bottom Blocks*. Write any of the following for latest engineering data.

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National Fireproofing Corp., Pittsburgh 12, Pa.

Ayer-McCarel-Reagan Clay Corp., Brazil, Ind.

Metropolitan Paving Brick Co., Canton 2, Ohio

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Easy to Lay
Won't Clog
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Last a Lifetime

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PUBLIC WORKS

*The engineering authority in the
 city-county field*

Founded in 1896

Edited by

W. A. HARDENBERGH and A. PRESCOTT FOLWELL

OCTOBER, 1948

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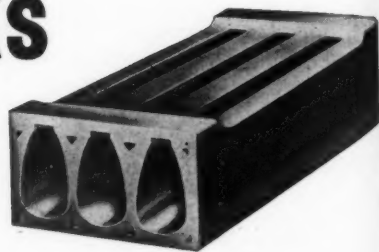
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One of the World's Largest Trickling Filter Projects Uses NATCO Blocks



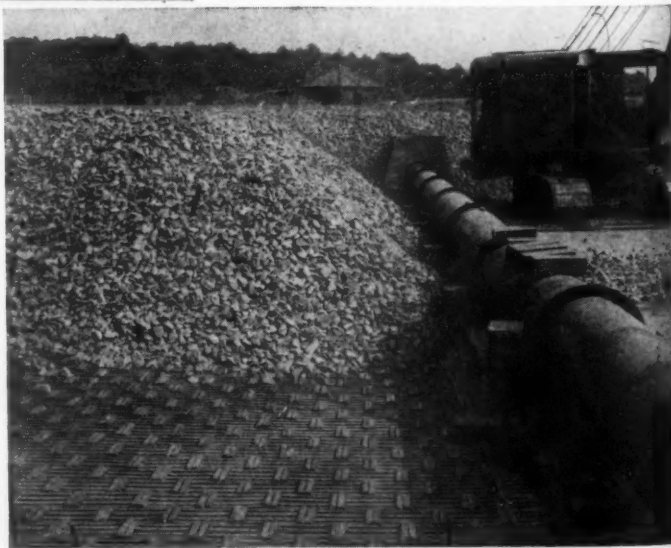
WORCESTER, MASS., Trickling Filters from the air. Earl R. Perry, Chief Engr. Hayden, Harding & Buchanan, Cons. Engrs.

NATCO Unifilter Blocks in the floor of Plant No. 1, Worcester, Mass., Sewage Treatment Plant.

Worcester, Mass., is only one of many cities that have chosen NATCO Unifilter Blocks for life-long service in their trickling filters. Made of salt glazed, hard burned clay, they are light in weight and easy to lay. Rapid, uniform and widespread ventilation of the entire trickling filter bed is insured by three long top slots in each unit.

Smooth, egg-shaped run off channels guarantee maximum flow. Maintenance costs are low due to the great strength of these blocks. Trickling filters using NATCO Unifilter Blocks are efficient, economical and long-lived.

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When you need special information—consult the READERS' SERVICE DEPT. on pages 85-88

The Editor's Page

The Troubles of Scientists Engaged On Government Work

There has been a good deal of talk about scientists engaged in governmental work and the possibility that anyone working for the government in such a capacity will be "smeared." We don't like that word; it is too one-sided; what we need is a word that also may include the implication that possibly one is getting what is coming to him.

We do not know much about the present situation, but we have been entrusted in the past with much top-secret material and we have had quite some contact with research personnel. From the latter experiences, we know there are many exceedingly high-class and capable men in research—men who are outstanding also in other abilities. We also know that some research men are extremely simple fellows, with no talent outside of research and little judgment. We think it is this latter group that has caused, and has been involved in, controversy. There may also have been some cases of downright dishonesty.

No one wants the cashier of his firm or the teller of his bank to consort with thieves, gamblers and short-change men. To avoid company of this sort is an obligation that the cashier or teller takes when he enters this field of work. If he breaks this obligation, there is a time-honored remedy. Too many of our simple, but often talkative, research men either do not realize the wisdom behind this age-old practice, or they think that exceptions should be made for them.

Research scientists, especially those entrusted with secret data, should realize that this principle applies with full force to them, and that there is a binding obligation on them to be loyal. They should realize that appearances also count and that they must avoid association with the governmental equivalent of the speak-easy, the red-light district, and the lottery gang. Even though they maintain spotless purity, it doesn't look well to have such friends.

Putting it in rough language, the man who keeps his nose clean, won't have to worry. The man who hasn't any sense is going to get into trouble sooner or later, whether he works for the government or someone else.

One other thing: It seems to us that a realistic method of selecting personnel is badly needed.

There's a Right Way To Do It

You can spot an experienced workman by watching him perform a single task, especially if you are skilled in construction yourself. Take a simple job—removing a manhole cover. The man who knows how can do it without damage to fingers or toes. Yet the New Jersey Highway Department, which should have credit for the idea behind this editorial, reports seven injuries during the half-year from this cause.

For the foreman or the superintendent to know the right way to do a thing is not enough. The men must be taught what the proper procedure is. In these days of high-cost labor, the proper method of doing a thing

saves money; and it also reduces losses from injuries. Soundly conceived and executed training programs are the answer.

It is often possible to enlist the help of a state or local college to plan the training program. Also talk to the insurance company carrying your liability and compensation insurance. In addition to getting helpful data on procedure, you may be surprised to find out how much you can save.

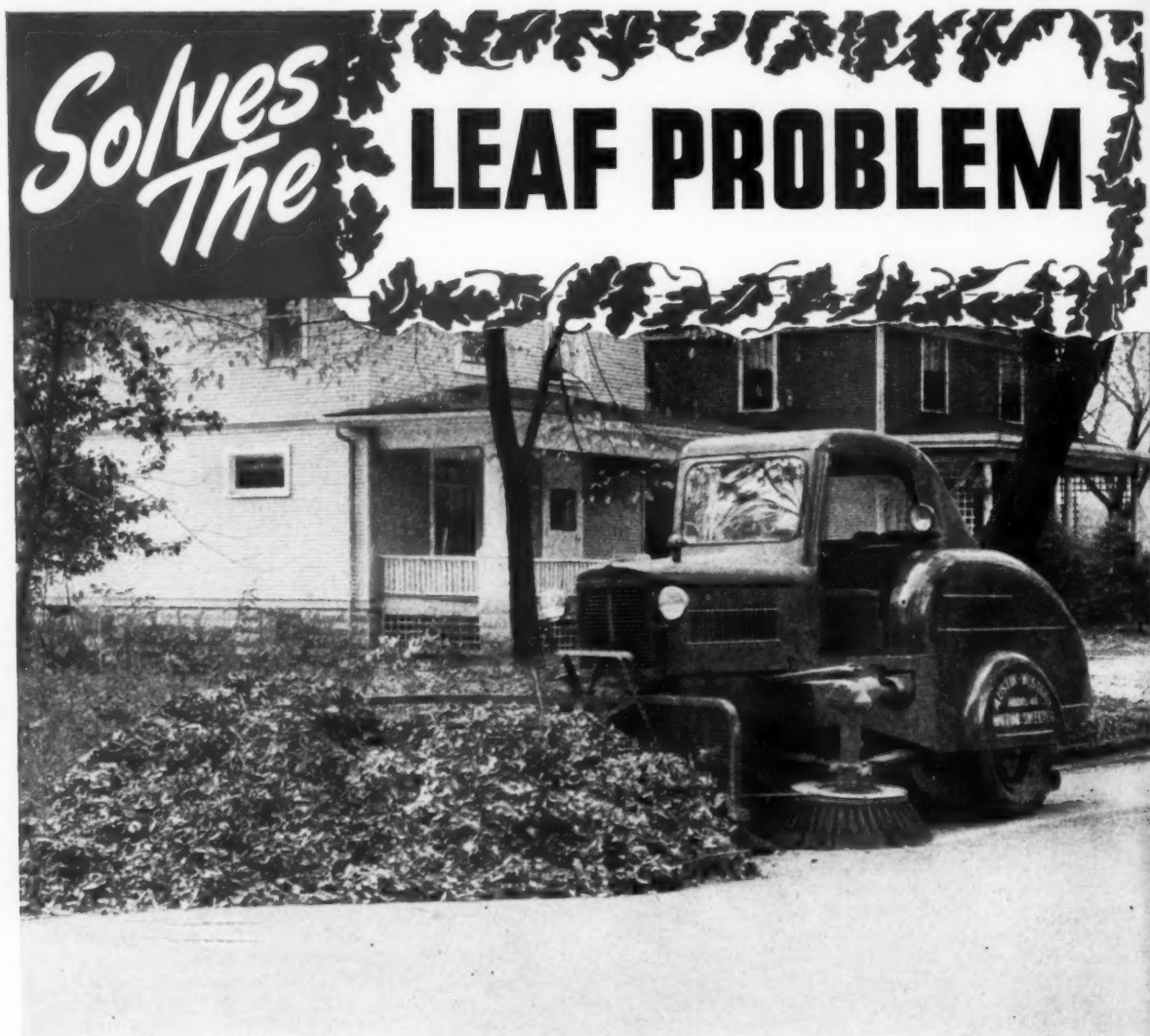
What's Wrong With Army Engineering?

One thing wrong with Army engineering is that a good many—maybe most—of the officers in the Corps of Engineers are not engineers. Just to see what the situation was, your editor had a private survey made of the qualifications of the post engineers and their assistants in two Army areas. These post engineers are generally analogous to city engineers. They are responsible for water works, sewerage, sewage treatment, highway construction and maintenance, waste collection and disposal, construction, and many other things. They should be good men. No one but the government could afford not to have good men in these positions.

The results of the survey? Of the 73 post engineers and assistants in posts of all sizes, from the very largest on down, in these two Army areas, 32 were qualified engineers according to a fairly liberal interpretation of the engineering licensing and registration laws in the states in which they were working. This does not mean that these men were registered engineers, but only that their training and background indicated that they would be eligible for registration. Of the others, 32 were clearly not engineers by any stretch of the imagination or any legal interpretation of the term. The other 9 might or might not be capable, as data regarding them were too few to judge properly.

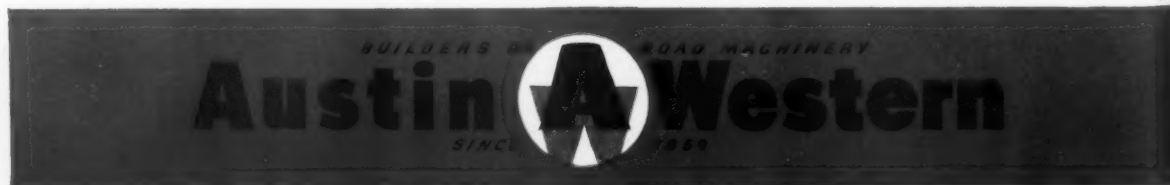
Thus the Corps of Engineers may be considered, on the basis of this partial survey, to be about half and half, engineer and non-engineer. This brings up two very pertinent and important points. The first one is that, in case of a national emergency, these men, whether or not they are engineers, would be quickly promoted to positions of authority in the Corps of Engineers and would no doubt be in command of qualified engineers brought in from civil life. There is little encouragement in this fact for the qualified engineer. He would have no more opportunity and maybe less, than in the recent war for the full exercise of his talents. Drab is the word for him. A much stronger word is needed to describe the outlook for effective use of engineers in an emergency.

The second point is to what extent the employment of unqualified engineers by the Army is violating the laws of the states in which they are located. Some states may provide certain exceptions to registration which would cover such cases. But whether they do or not, employment of unqualified men in engineering positions of responsibility is inexcusable.



Troublesome leaves that clog sewers and make driving hazardous are handled efficiently by the Leaf Broom attachment for the Model 40 Sweeper. Leaves are pushed ahead of the Sweeper until a suitable pile is formed. Behind the Leaf Broom, sweeping is going on as usual. A handy lever, beside the driver, elevates the Leaf Broom for dumping, or when not in service. Your nearby A-W Distributor will be glad to tell you the whole story.

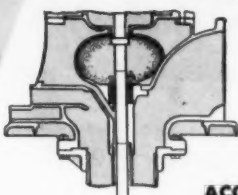
AUSTIN-WESTERN COMPANY • AURORA, ILLINOIS, U. S. A.



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... that eliminate overloading, sand-locking and costly stoppages
 ... minimize wear
 ... eliminate the need for sealing or wearing rings.

**ACCESSIBLE PACKING BOX**

... located at the surface where it is easily inspected, tightened or repacked.

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Performance
with**



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Almost any good pump will give you performance ... at the start. But Pomona Vertical Turbine Pumps give you sustained performance ... consistent efficiency for years plus the fundamental simplicity of design that adds up to lowest operating and maintenance costs. Here's why!

**ADJUSTABLE FOR CAPACITY**

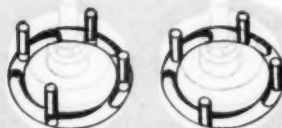
AND WEAR. With a simple "at the surface" adjustment, capacity can be varied over a wide range without throttling. Adjustment can also be used to compensate for wear to retain peak efficiency for life.



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A name worth remembering

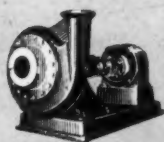
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NON-REVERSE RATCHET ... prevents pump and motor from rotating backwards
 ... eliminates possible damage to pump from accidental power reversal
 ... reduces wear and maintenance.

PLUS true water lubrication and many other important advantages your Fairbanks-Morse Pomona dealer or branch pump engineer will be glad to demonstrate. Fairbanks, Morse & Co., Chicago 5, Ill.

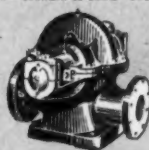
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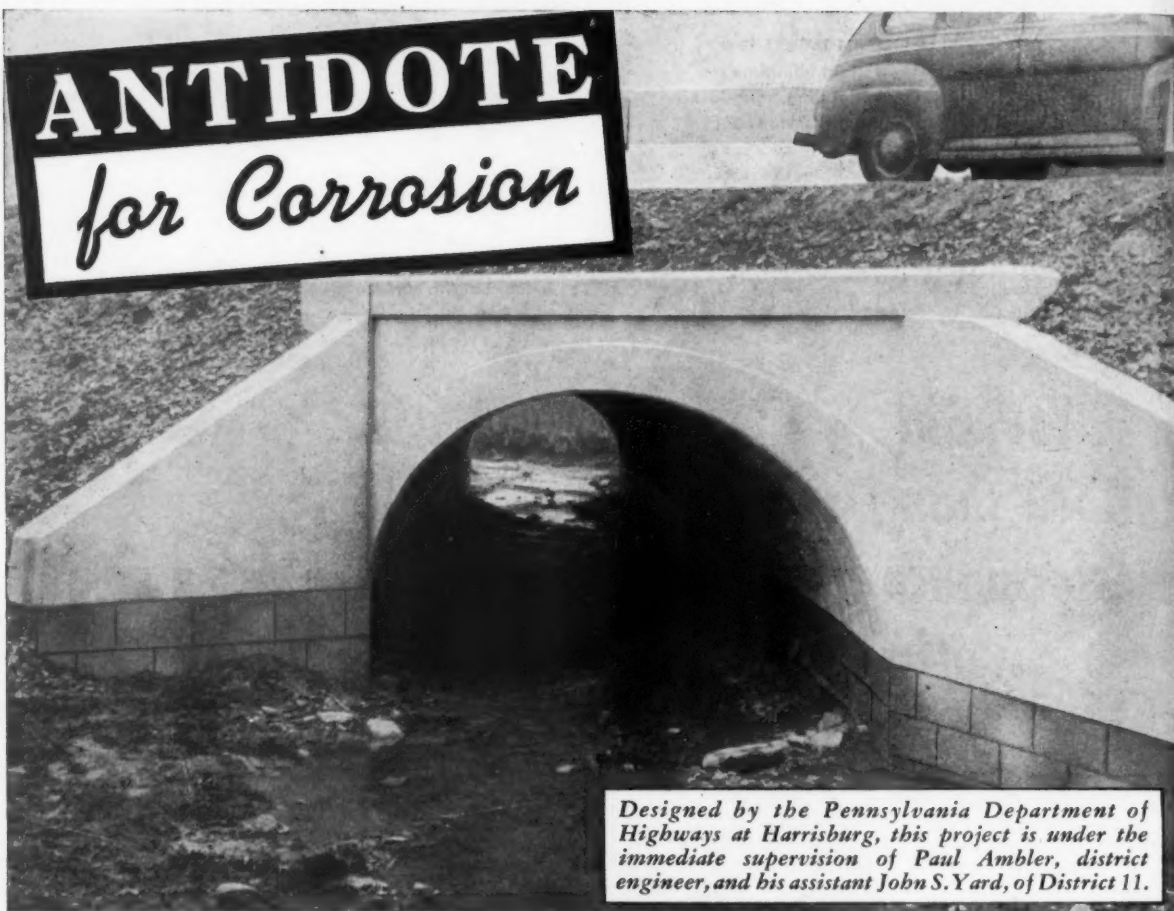
Centrifugals



Built-together

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ANTIDOTE for Corrosion



Designed by the Pennsylvania Department of Highways at Harrisburg, this project is under the immediate supervision of Paul Ambler, district engineer, and his assistant John S. Yard, of District 11.

WHEN relocating a section of the William Penn Highway, U. S. Route 22, east of Pittsburgh, Pennsylvania, engineers ran into an area where the streams contained a high concentration of deteriorating acid. Since the project called for eleven culvert structures ranging from 100 to 250 feet in length and ten to forty feet in span, piers and abutments for a 5-span bridge, and approximately 20,000 linear feet of underdrain, this acid presented a serious problem.

Solution? Every single inch of underdrain, mains and masonry that came in contact with the water was constructed of, or lined with acid-resisting *vitrified clay*.

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For specific information on your Clay Pipe problem, write the details to the office nearest you.

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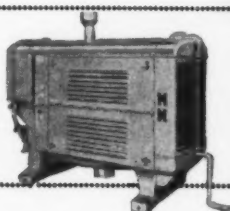
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AS INDUSTRIAL TRACTORS



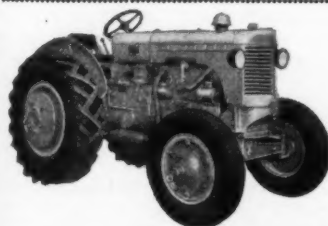
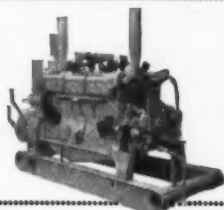
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Model 283-4A $4\frac{1}{4}$ " x 5"—4 Cylinder 52 H.P. at 1400 RPM Burning Gasoline. 283 cu. in. displacement. Wt.: 1850 lbs. Model 403-4A $4\frac{3}{8}$ " x 6"—4 Cylinder 64 H.P. at 1200 RPM Burning Gasoline. 403 cu. in. displacement. Wt.: 1950 lbs.



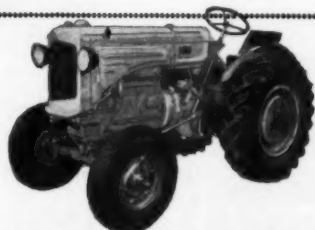
Model HUA $4\frac{3}{8}$ " x 6"—6 Cylinder 94 H.P. at 1200 RPM Burning Gasoline. 605 cu. in. displacement. Wt.: 3000 lbs.

Model 1210-12A $4\frac{3}{8}$ " x 6"—12 Cylinder 206 H.P. at 1400 RPM Burning Butane Gas. 1210 cu. in. displacement.



Model UTI Industrial Tractor 49 H.P. 126" Overall Length. 76" Overall Width. 16" Turning Radius.

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now at an all-time high.

More gasoline-powered machinery, ap-
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ever before.

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Milwaukee 1, Wisconsin, U. S. A.



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Letters

TREATING SEWAGE WITH GARBAGE

In a brief note on "Treating Ground Garbage with Sewage" which appeared on page 73 of the July, 1947, issue of PUBLIC WORKS, it was indicated that the cost of garbage disposal at the sewage plant would be between 10¢ and 50¢ per ton.

I am currently completing a pamphlet on garbage collection and disposal practices for use by municipal officials in Tennessee, and am assembling data on comparative costs of various types of disposal. I wonder if the figures given in your 1947 issue would be valid today, and, if so, if you would give us permission to employ them in our publication? Due credit to PUBLIC WORKS would, of course, be given.

CHARLES L. CRANGLE,
State Planning Commission,
Nashville, Tenn.

This was an abstract of an excellent paper by S. L. Tolman, Jeffrey Mfg. Co., Columbus, O., and he can probably do better than anyone else in guessing the validity of the figures as of today. The Editors.

GARBAGE DISPOSAL INTO SEWERS

On Page 65 of your August, 1948, issue is carried an abstract of an article which appeared in *Public Management* relative to the disposal of ground garbage into sewerage systems. In this article it is reported that Gary, Indianapolis, and Marion, Indiana, dispose of ground garbage into sewerage systems.

The above mentioned material is in error and we wanted to call it to your attention since it will prevent many misunderstandings. Marion, Indiana, is the only plant in this State, practicing this method of garbage disposal at the present time. The Gary plant was designed to handle garbage but the problems involved in separate collection of garbage from refuse has prevented the municipality from proceeding with their plans. Indianapolis did some work in the early days to determine if this method of disposal was feasible. The municipality has not proceeded with any plans, however, for the disposal of garbage in this manner in view of its investment in the garbage reduction plant.

B. A. POOLE, Director of
Environmental Sanitation,
Indiana State Board of Health.

Sorry! That's what we get for using the scissors and paste pot.

A NEW IDEA IN SNOW REMOVAL

We are very proud of our snow removal in this city and wish to make our experiences available to other communities. We believe a village with a busi-



Above: the S. S. Harvester at docks of International Harvester's Chicago Steel Mill.

**Quality
BUILDS
Quality**

THAT'S THE INTERNATIONAL WAY from raw materials to finished trucks

International Truck quality begins long before truck building starts. It begins with control of the raw materials that produce rugged truck strength and power.


Quality Builds Quality! That rule governs the selection and approval of every material and part used in every International Truck. Here's one example:

- International Harvester's own ships bring iron ore from Minnesota's Mesabe Range down the lakes.
- These ships also transport coal from International Harvester's mines in Kentucky. The coal is loaded at the lake port of Sandusky, Ohio.

■ Ore and coal are brought to International Harvester's steel mill in Chicago, where *Quality* steel, including one of a special type developed by International Harvester's technicians, is made to rigid specifications for International Trucks and International Engines.

Yes, *Quality Builds Quality*. Note with what success:

For 16 years more new heavy-duty International Trucks have been bought by American commerce and industry than any other make.

Motor Truck Division
INTERNATIONAL HARVESTER COMPANY • Chicago 



Tune in James Melton on "Harvest of Stars." CBS Wednesday Evenings.

INTERNATIONAL Trucks

When writing, we will appreciate your mentioning PUBLIC WORKS

Whether This Fellow does a Nose Dive... or Blows His Top



**your Bell and Spigot
Jointing can go right
along just the same!**

Cold or heat makes no difference. In either and both, Tegul-MINERALEAD melts and pours easily — to make joints that don't cultivate even a nodding acquaintance with Old Man Trouble.

And here are a few more of Tegul-MINERALEAD's good points:

- No possible shaking-up of correct composition, on those possibly rough journeys to the job. Coming in handy 5 lb. ingots, this compound refuses to be shaken up . . . or down.
- No harm from wetting. Some time ago, under flood conditions in Virginia, several thousand pounds of Tegul-MINERALEAD was submerged for days. When the flood receded, the ingots were all ready to go to work.
- 5 lb. ingots are so much handier than heavy sacks — to work with, to store and to ship. Your workmen will appreciate this advantage.
- Also, the carton of ten ingots makes a convenient package.
- The plasticizing agent in this sulphur base compound cuts down initial leakage. You can go right ahead with back filling, ending those traffic hazards that come with open trenches.
- And finally, and most important of all — Tegul-MINERALEAD makes lastingly tight joints with sufficient flexibility to prevent damage to line with normal settling of the terrain. Lead jointing will open up under vibration — Tegul-MINERALEAD joints will not.

No better time than right now to send for the full story of this time-labor-and money-saving compound for Bell & Spigot water main jointing.

THE
Atlas Mineral

PRODUCTS COMPANY OF PENNA.

MERTZTOWN

PENNSYLVANIA

- *ATLANTA 3, Ga., 452 Spring St., N. W.
- *CHICAGO 1, Ill., 333 No. Michigan Ave.
- *DETROIT 2, Mich., 2970 W. Grand Blvd.

THE ATLAS MINERAL PRODUCTS CO. OF TEXAS, INC. Box 252, Houston 1, Texas

- OMAHA, Neb., 423 South 38th Avenue
- DALLAS 5, Tex., 3921 Purdue St.
- *DENVER 2, Colo., 1921 Blake St.
- *HONOLULU 2, Hawaii, U.S.A.
- *KANSAS CITY 8, Mo., 422 B.M.A. Bldg.
- *LOS ANGELES 12, Calif., 172 S. Central Ave.
- NEW ORLEANS 12, La., 208 Vincent Bldg.
- NEW YORK 16, N. Y., 280 Madison Ave.
- PITTSBURGH 27, Pa., 4921 Plymouth Rd.
- ST. LOUIS 8, Mo., 4485 Olive St.
- OKLAHOMA CITY 2, Okla., 708 Braniff Bldg.
- *SALT LAKE CITY 11, Utah, 925 S. 6th West St.
- SAN FRANCISCO 7, Calif., 115 Townsend St.
- *SEATTLE 4, Wash., 1252 First Avenue, S.
- TUPELO, Miss., 517 South Spring St.

*Stock carried at these points

IN CANADA: Atlas Products are manufactured by H. L. BLACHFORD, Limited,
977 Aqueduct Street, Montreal 3, P. Q., 86 Bloor St. W., Toronto, Ont.

When you need special information—consult the READERS' SERVICE DEPT. on pages 85-88

ness section of two or three blocks which could not afford a snow loader could afford a sand loader; and that, in addition to its normal uses, it could clear the business section of snow in the winter.

A. H. McCAFFREY,
City Engineer, Johnstown, N. Y.

On another page of this issue we have published an article by Mr. McCaffrey showing how his city has utilized a sand loader for snow removal.

RESERVE OFFICERS' RETIREMENT

In your editorial on this subject in the August issue, you state there is a requirement of at least 4 years of active duty for retirement. I have a copy of the bill and have been unable to find such a requirement.

F. J. LAVERTY,
*Sup't. of Public Works,
Ithaca, N. Y.*

The editor was in error. There was a delay in making copies of the bill available, and he used as a basis for the editorial the report of the subcommittee handling the bill. In many or most cases, such reports govern. The one-half percent per year for inactive duty was also changed, and officers now get a credit of 50 days per year for service prior to enactment of the law. This tends to reduce the amount of retirement pay.

PUBLIC OPINION

I do not want to be accused of "Putting Pressure on the Editor" but I do want to tell you what my company is doing "Toward Creating Favorable Public Opinion" for the waterworks industry. Allis-Chalmers is currently conducting an advertising campaign aimed at prestige building. Several advertisements of an unusual and striking nature have been used, one of which is of special interest to waterworks people. These are being published in periodicals which have a combined circulation of nearly three million. It is hoped that our "Mighty Good Stuff" advertisement will have a part in drawing attention to the fine job regularly and unostentatiously done by our waterworks industry.

GRANT M. HINKAMP, *Engineer,*
Allis-Chalmers Mfg. Co., Milwaukee.

We are happy thus to call attention to what one of our leading manufacturers is doing in contributing to the better understanding and fuller recognition of the waterworks industry.

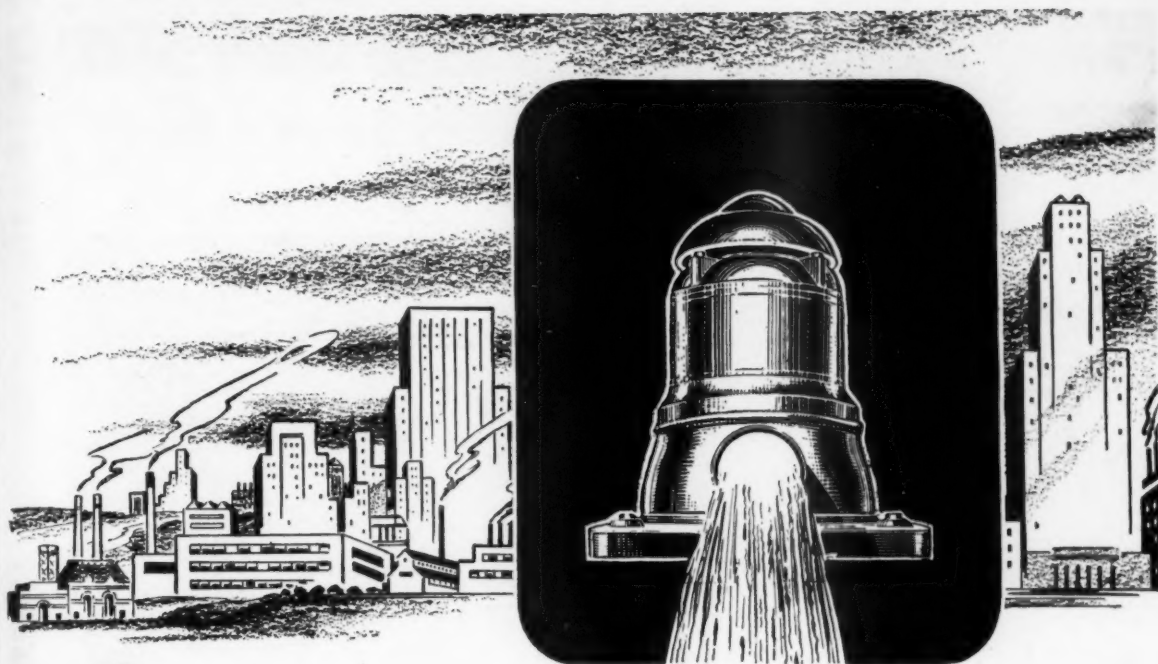
USING PUBLIC WORKS' MANUALS

I take the Manuals apart and punch them for loose leaf note books. The chapter headings are then used as the basis for the note book; and information on design, prices, etc., can be properly placed for easy reference, along with the products. The Manuals are well written and very useful.

GEORGE E. MILLER,
Civil Engineer, Omaha, Nebr.

Thanks for a good tip on how to use the Manuals effectively.

AFFI
★ Lay
Tenn.
Co., L
New



Again We Say...

"BETTER BUILT FOR BETTER SERVICE"

For nearly seventy years Layne Well Water Systems have been recognized as the world's finest, but now and then we like to remind our friends—and ourselves of the reasons why. From pump head to screen point, every single part of a Layne Well Water System is definitely "Better Built for Better Service." Maintaining that highly essential standard, especially during material shortages, has not always been an easy task, but not once has a compromise been made.

THE COMPANIES LISTED BELOW

—All are fully equipped organizations providing complete Well Water Development service, including explorations, well drilling and pump installations for municipalities and industries. They maintain valuable records of water bearing formations in their respective territories as a helpful guide on new installations.

Today, Layne Well Water Systems are actually finer in quality of materials, higher in efficiency and better in construction than ever before. This is particularly pleasing to the entire Layne organization, for it affords genuine satisfaction to have users well pleased.

The advantages of owning a well

water system in which full confidence may be placed is too obvious for comment. An unfailing and adequate supply of water is of utmost importance. It is a matter of record that the fine quality of Layne Well Water Systems is remembered and appreciated long after the purchase price has been forgotten.

LAYNE

WELL WATER SYSTEMS

For further information about Well Water Systems or Vertical Turbine Pumps, request catalogs, bulletins, etc. No obligation.

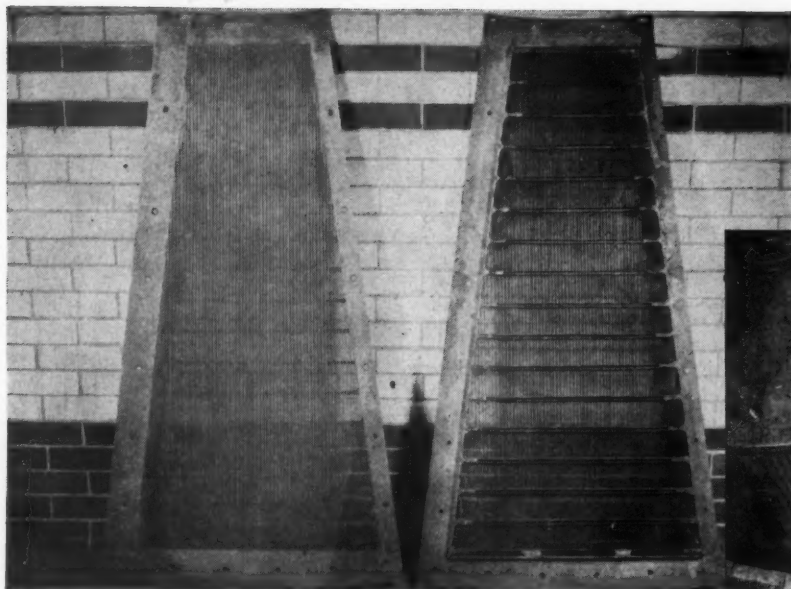
LAYNE & BOWLER, INC.

General Offices
MEMPHIS 8, TENN.

AFFILIATED COMPANIES—Layne-Arkansas Co., Stuttgart, Ark. ★ Layne-Atlantic Co., Norfolk, Va. ★ Layne-Central Co., Memphis, Tenn. ★ Layne-Northern Co., Mishawaka, Ind. ★ Layne-Louisiana Co., Lake Charles, La. ★ Louisiana Well Co., Monroe, La. ★ Layne-New York Co., New York City ★ Layne-Northwest Co., Milwaukee,

Wis. ★ Layne-Ohio Co., Columbus, Ohio ★ Layne-Pacific, Inc., Seattle, Wash. ★ Layne-Texas Co., Houston, Texas ★ Layne-Western Co., Kansas City ★ Layne Minnesota Co., Minneapolis, Minn. ★ International Water Supply, Ltd., London, Ontario, Canada ★ Layne-Hispano Americana, S. A., Mexico, D. F.

When writing, we will appreciate your mentioning PUBLIC WORKS



NEW EVERDUR SCREEN for Mamaroneck, N. Y. Sewage Treatment Plant

Mamaroneck, Rye and Yonkers Plants, all operated by Department of Public Works, Westchester County, N. Y., to install similar Everdur screens in long range improvement program.

EXPERIENCE of Westchester County Division of Sewers with Everdur* Metal through the years has resulted in specification of these strong, corrosion-resistant copper-silicon alloys for screens and many other equipment items that must meet severely corrosive conditions.

Top photo shows front and back of fine screen sectors, fabricated by the Hendrick Manufacturing Company, Carbondale, Pa. Inset shows a portion of the finished screen installed at Mamaroneck.

Careful records kept at hundreds of water works and sewage treatment plants for the past 20 years offer conclusive evidence of the long-run economy of Everdur Copper-Silicon Alloys. In every installation the high strength and

toughness of these alloys combine with their corrosion resistance to provide outstanding serviceability. Ease of hot or cold working, forging, machining and welding are factors in speedy, economical fabrication.

For more detailed information, write for Publication E-11.

*Reg. U. S. Pat. Off.

40587

"THE NATIONAL GUARD DEFENDS AMERICA—JOIN NOW!"



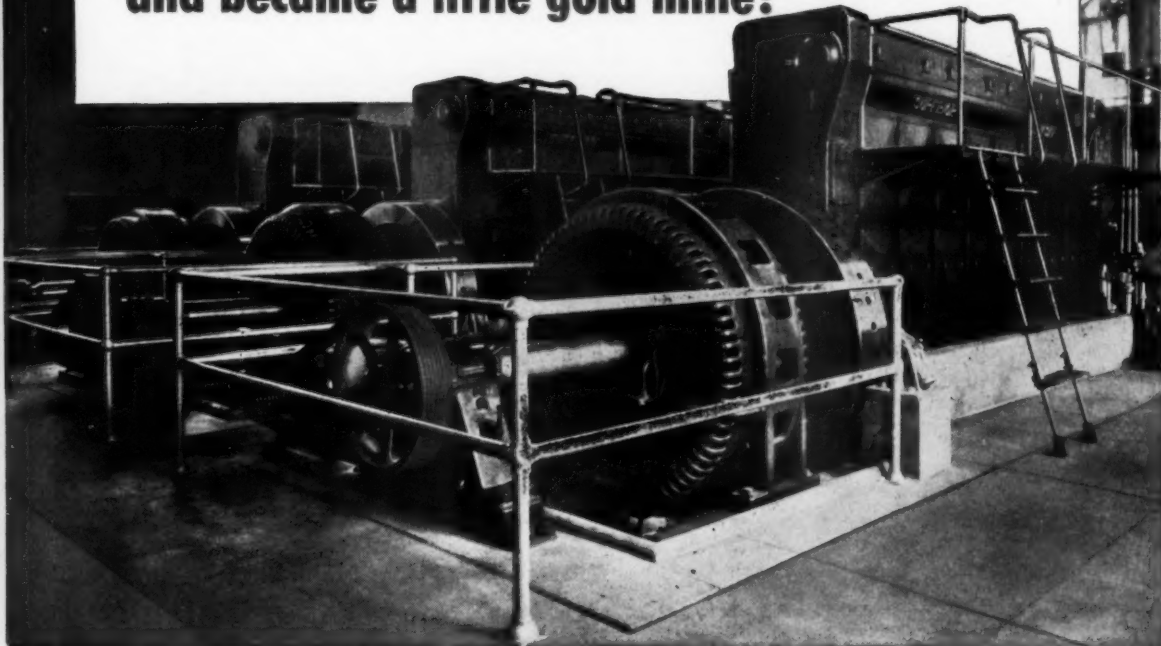
Everdur

COPPER-SILICON ALLOYS

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut
 Subsidiary of Anaconda Copper Mining Company
 In Canada: ANACONDA AMERICAN BRASS LTD.
 New Toronto, Ont.

THIS POWER PLANT GREW AND GREW... and became a little gold mine!



● In 1939 an Arkansas town plunged itself into a \$240,000 debt to build a central power plant equipped with three, 8 cylinder 620 hp. Superior Diesels. This plant proved to be a gold mine.

The demand for electrical power increased so rapidly that during the first five years the plant paid off the debt—provided free street lighting—cut consumer rates—and created a cash reserve! As a result of this performance, two additional 1200 hp. Superior Diesel Engines have been added to increase the plant's capacity.

Hundreds of other communities throughout the country are benefiting by the dependability and economy provided by Superior Diesels. These big, husky engines are used for water supply systems, sewage disposal plants, airport lighting and for many other vital services.

Superior Diesels are made in supercharged and non-supercharged models that range from 170 to 1500 horsepower. One of our field engineers will be glad to point out the advantages these engines have for your community.

PUSH-BUTTON DUAL FUEL

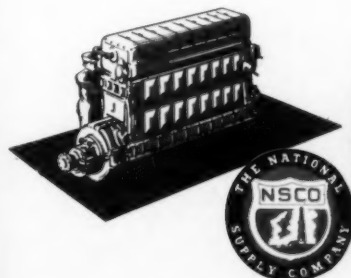
A Superior Feature

JUST PRESS
A BUTTON
TO BURN
YOUR CHOICE
OF FUEL



Superior is the first and only Diesel with push-button control of fuel selection that permits you to switch from oil to gas; or gas to oil instantly—with the flick of a finger.

SUPERIOR ENGINE DIVISION OF
THE NATIONAL SUPPLY COMPANY
Plant and General Sales Office: Springfield, Ohio



Superior
DIESEL

Only Superior Diesel Engines
Give You Superior Features

—Visit—

Grit & Sludge Removal, Screening and Mixing Equipment Headquarters



LINK-BELT Booths Nos. 15, 16, 17. F. S. W. A. Convention, Detroit, Oct. 18-21

Shown above is part of the Link-Belt exhibit at the 1947 Federated Sewage Works Association Convention held at San Francisco.

At this year's convention, we will occupy three booths. The first section will cover grit removal and sludge collection equipment featuring the Link-Belt Straightline grit chamber and Straightline sludge collectors.

The second section will be devoted to screening methods and equipment such as Link-Belt Straightline bar screens, trash screens, Tritor screens and vibrating screens. Link-Belt mixing equipment to be featured will be the Link-Belt line of flash mixers and Link-Belt vertical slow and horizontal slow mixers.

Another part of the exhibit will cover Link-Belt power transmission machinery which consists of a complete line of ball and roller bearings, silent and roller chain drives, speed reducers, variable speed transmissions and the Electrofluid Drive.

The entire exhibit has been designed to give you valuable knowledge and expert advice on all of these subjects. We sincerely hope you will plan to visit with us.

LINK-BELT COMPANY

Philadelphia 40, Chicago 9, Indianapolis 6, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities.

11,274

No Two Cities Have Exactly The Same Trash and Rubbish Collection Problem...



The amazingly simple stages of pick-up, hauling and dumping the detachable containers are shown in the three photos above. In the top photo, driver has backed the truck hoisting unit up to the 8 cu. yd. apartment type container, attached two chains and returned to the hydraulic controls in the truck cab. In center photo, container has been hydraulically lifted into carrying position ready for hauling to disposal area for automatic dumping as shown in the bottom photo.

It's true! No two cities have the same problems of Trash and Rubbish Collection. In fact, no two parts of any one city have the same problems. In downtown areas, high concentrations of bulk rubbish must be collected almost daily; in housing centers some collections are made twice weekly and in residential districts one collection a week is sufficient. That's why in every city, a flexible system is needed. The Dempster-Dumpster System of rubbish collection meets every requirement.

With the Dempster-Dumpster System, your city can "tailor" rubbish collection to meet the output of any given section, regardless of the volume. Here's how it works. Enclosed rubbish containers, such as the one shown below are placed at collection points in business districts, apartment and housing areas, at schools and at factories. Once the rubbish is placed in these containers, no wind or animal can scatter it, no rats or flies can contaminate it. As these containers are filled, a Dempster-Dumpster truck hoisting unit, operating on scheduled rounds, picks up each container hydraulically, hauls it to and dumps it at the disposal area, then returns the empty container to its original position. One truck and one man, the driver, handle the entire operation at a tremendous saving in time, money and equipment. Why not write today for complete information.



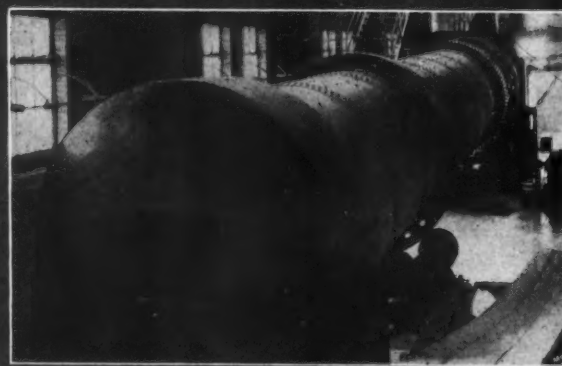
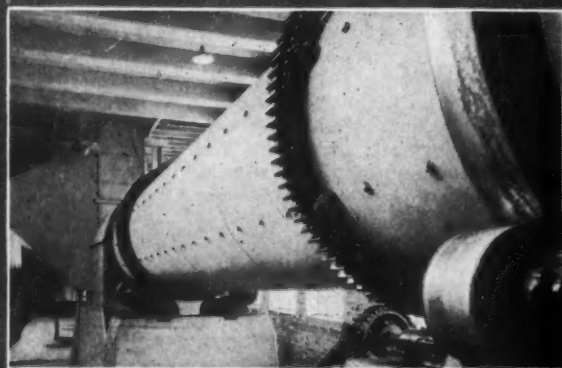
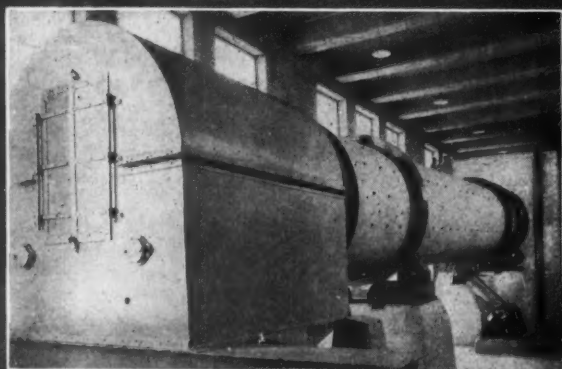
**DEMPSTER
DUMPSTER**
TRADE MARK REG.

DEMPSTER BROTHERS, Inc., 998 Dempster Bldg., Knoxville 17, Tenn.

When writing, we will appreciate your mentioning PUBLIC WORKS

General American Louisville

ROTARY DRYERS



Louisville Rotary Dryers, as designed and built by General American, offer a continuous, efficient and economical means of drying municipal wastes such as sludges, screening and garbage.

In all Louisville Rotary Dryers, the material to be dried is fed continuously into one end of the dryer cylinder, is tumbled in either direct or indirect contact with the heating medium and discharge — also continuously, and at the desired dryness, — from the opposite end of the machine.

General American maintains laboratories and pilot plants in order to determine and recommend the correct type of drying equipment. In some instances, entirely new drying techniques have been developed for materials which have formerly baffled all attempts to rotary continuous drying.

Other General American Products

Sludge Gas Holders
Turbo-Mixers
Sludge Filters
Tanks • Stacks

GENERAL AMERICAN TRANSPORTATION CORPORATION

Process Equipment Division

SALES OFFICE: 10 East 49th St., Dept. 830 New York 17, N. Y.

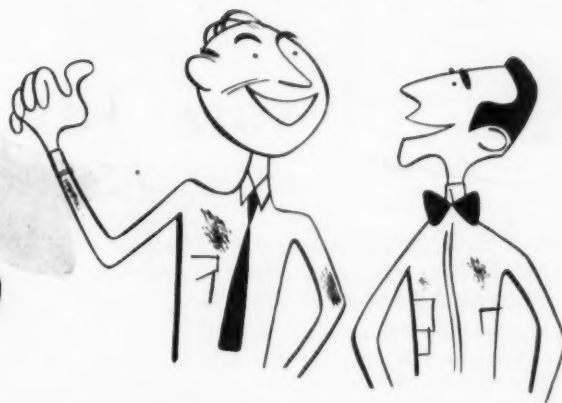
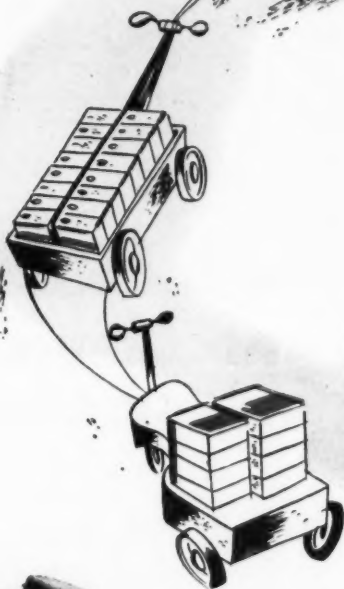
WORKS: Sharon, Pa., East Chicago, Ind.

OFFICES: Chicago, Cleveland, Louisville, Orlando, Pittsburgh, St. Louis, Salt Lake City, Sharon, Washington, D. C.





"The Boss likes lots
of HTH handy"



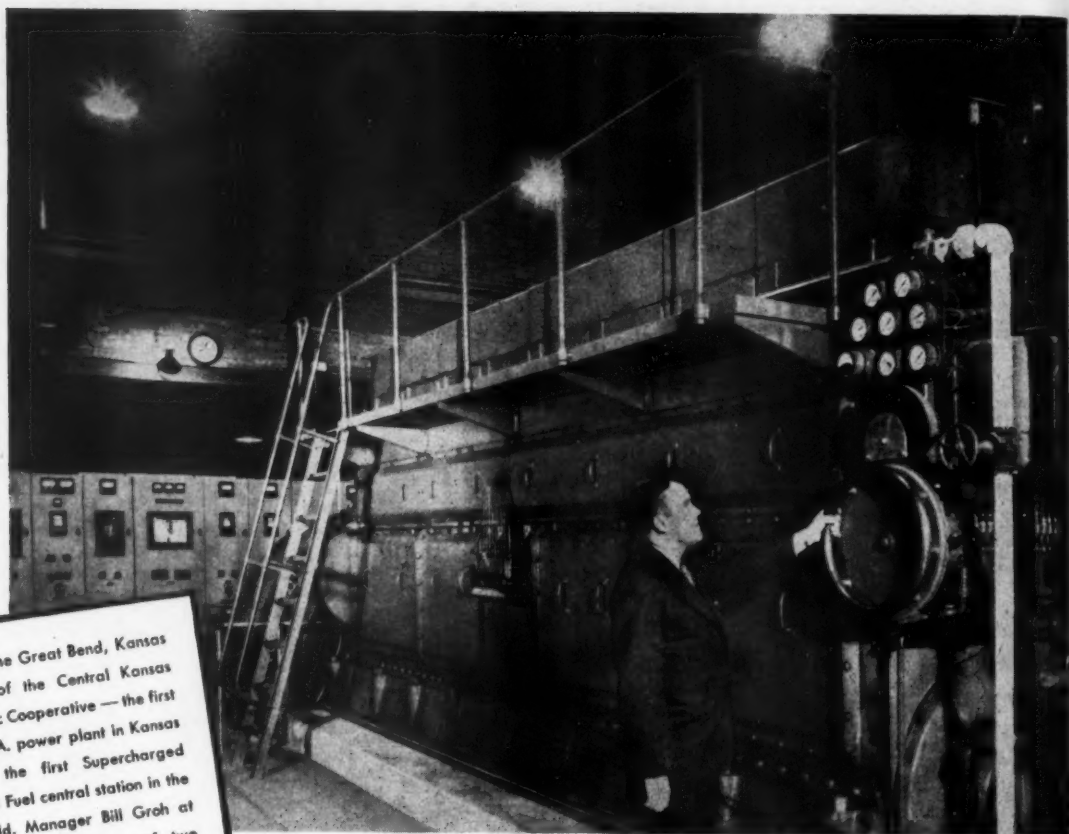
Sanitation HTH is available in cases of nine 5-lb. cans and in 100-lb. drums.

This Water Works Chief won't run short of HTH. Any time it comes to sterilizing a new main, an aqueduct or tank, he's got the wherewithal. There's plenty of HTH for removing slime accumulations or algae...cleaning reservoirs, basins, flumes. And in case of power shut-off, accidental pollution, floods or other emergencies—he's on top for having HTH on hand.

You, too, will find it helpful to keep this low-cost, dependable chlorine carrier handy. Full details in the 1948 booklet: "Hypo-Chlorination of Water". Write for your copy. Mathieson Chemical Corporation, 60 East 42nd Street, New York 17, N. Y.

Sanitation HTH... Liquid Chlorine... Chlorine Dioxide... PH-Plus (Fused Alkali)... Caustic Soda... Soda Ash... Bicarbonate of Soda... Ammonia, Anhydrous & Aqua... Dry Ice... Carbonic Gas... Sodium Chlorite Products... Sodium Methylate

Mathieson
SANITATION HTH



Inside the Great Bend, Kansas plant of the Central Kansas Electric Cooperative — the first R. E. A. power plant in Kansas and the first Supercharged Dual Fuel central station in the world. Manager Bill Grah at the control of one of two Worthington Type SEHGO-B Dual Fuel Diesel Engines.

"TOTAL FUEL AND LUBRICANT COST PER KWH — \$0.0015+!"

Kansas R. E. A. Station Reports Steady Savings With Worthington Supercharged Dual Fuel Diesels

One way to get the real low-down on economical generation of electric power is from a progressive R. E. A. plant. Here, in part, is what the Central Kansas Electric Cooperative Association has to say about its Worthington Dual Fuel Diesel equipment:

"Our engines have run approximately 3050 and 4100 hours, respectively, under loads varying from 300 to 1160 KW. Operation has been satisfactory at all loads.

"One remarkable point is the low lubricating oil consumption . . . Also, we have had very little maintenance work.

"The past month the total fuel and lubricant cost per KWH generated has been 1.517 mills. . . . The saving of gas over fuel oil is very great.

"A fire necessitated shutting off our gas line for 12 hours. We switched to oil Diesel operation without any interruption."

Economy In Every Detail

With Worthington Dual Fuel Diesels you get outstanding thermal efficiency on the cheapest fuel available — oil, gas or oil-and-gas in any ratio — while Worthington's long leadership in developing Diesel design and performance means additional power for every operating-dollar you spend. For further proof that there's more worth in Worthington, contact Worthington Pump and Machinery Corporation, Engine Division, Buffalo, N. Y.

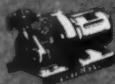
WORTHINGTON



**YOUR
PARTNER
IN
POWER
PROGRESS**

WORTHINGTON-BUILT AUXILIARIES

Diesel engines, 150 to 2,640 hp . . . gas engines, 175 to 1,720 hp . . . dual fuel engines, 225 to 2,640 hp.



Air Ring Compressors



Oil Transfer Pumps



Cooling Water Circulating Pumps



Evaporative Type Engine Water Cooler

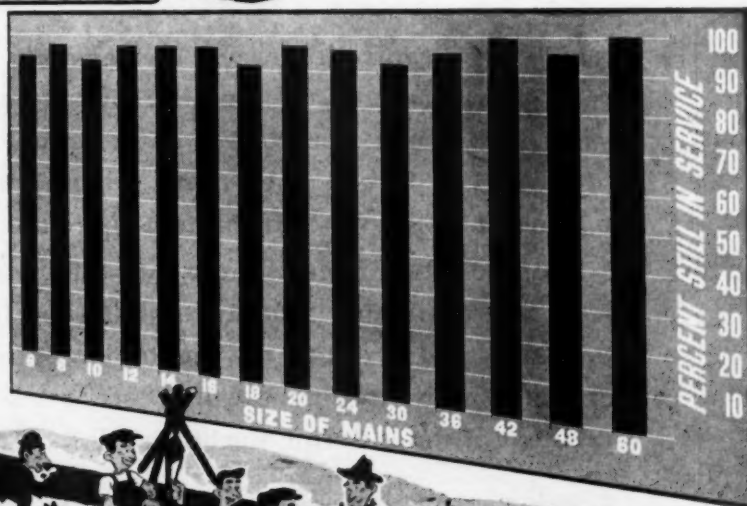
When you need special information—consult the READERS' SERVICE DEPT. on pages 85-88

THE SAGA OF 50 MILLION FEET OF CAST IRON PIPE

In the 125 years since 1817, 25 cities had laid 50 million feet of cast iron water mains in sizes 6-inch and up. What had happened to those mains and to other facilities? A committee representing three water works organizations determined to find out. For these 25 cities, large and small, stretching from Canada to Florida, provided a representative cross-section of water service conditions generally. Facts developed could therefore be accepted as valid by all water works men. The survey was recently completed and the findings published by the American Water Works Association.

What happened to the 50 million feet of cast iron pipe? The saga is told by the chart. It shows that, of all the cast iron water mains ever laid in the 25 cities since 1817, in sizes 6-inch and up, 96% are still in service. This statement is based on facts secured by pipe users, from users, for users! Cast Iron Pipe Research Association, Thomas F. Wolfe, Engineer, 122 South Michigan Ave., Chicago 3, Ill.

96% STILL IN SERVICE



96% of all cast iron water mains* laid in these 25 cities over a period of 125 years is still in service.

Alexandria, Virginia
 Babylon, New York
 Clinton, Iowa
 Clyde, New York
 Denver, Colorado
 Des Moines, Iowa
 Detroit, Michigan
 Huntington, West Virginia
 Jamaica, New York
 Merrick, New York
 Norwich, New York
 Ottawa, Ontario
 Philadelphia, Pennsylvania
 Portland, Maine
 Rochester (Suburban), N. Y.
 St. Mary's, Pennsylvania
 St. Paul, Minnesota
 Sag Harbor, New York
 Scranton, Pennsylvania
 Springfield, Massachusetts
 Summit, New Jersey
 Syracuse (Suburban), N. Y.
 Utica, New York
 * West Palm Beach, Florida
 Winnipeg, Manitoba

*Sizes from 6 to 60 inches.



CAST IRON PIPE SERVES FOR CENTURIES



ACCURATELY CONTROLS

rate of flow over long ranges

Simplex Type "S" rate of flow controllers, of the most advanced but proven design, meet all requirements of modern filter plants.

THESE CONTROLLERS OFFER THE ADVANTAGES OF:—

- Compact design, low weight
- Small overall dimensions
- Ball bearing mounted shaft
- Hydrostatically balanced, patented guillotine valves
- Horizontal or vertical installation.
- Simple direct action design
- Venturi tube type of differential pressure producer
- Quick starting from open position
- Response to slightest differential pressure
- Extreme accuracy of control over long ranges

TYPE "S" controllers are used extensively in controlling the rate of flow in filter effluent and wash water lines, controlling water levels on filter beds or in clear wells, and maintaining balance of input to output through filter plants.

Simplex Filter Gauges, for use with these controllers, are available in many combinations for indicating and recording the rate of flow or loss of head of water through the filters or for measurement of water during washing cycles.

For bulletin and full information write the Simplex Valve & Meter Company, 6750 Upland St., Philadelphia 42, Pa.

SIMPLEX

VALVE AND METER COMPANY

When you need special information—consult the READERS' SERVICE DEPT. on pages 85-88

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"Gee, Orgie, we haven't had a guest since they heard about
the new distributor for **PITTCHLOR**"

Yes, indeed, and you and your pal better scram, too, Orgie, because the handwriting's on the wall. The slightest exposure to Pittchlor means sure death to chlorine-susceptible bacteria and algae. So, if you value your life, get going—and fast!

A high-test, stable calcium hypochlorite—containing 70% available chlorine—Pittchlor is extremely effective for the chlorination of water supplies, treatment of sewage, and for numerous other disinfection, deodorization and general sanitation purposes.

Pittchlor is economical and easy-to-use... manually or through relatively simple feeding devices.



Packed in 5 lb. resealable cans (9 per case), 33 1/4 lb. cans (12 per case), 100 and 130 lb. drums.

Distributors Note

A few good areas are still open for distributing Pittchlor. Write today for particulars.

USE THIS COUPON

Pittsburgh Plate Glass Company
Columbia Chemical Division, Dept. D-806
Fifth at Bellefield, Pittsburgh 13, Pennsylvania

Gentlemen:

Send me information on—

☐ How I can become a Pittchlor distributor

☐ How to use Pittchlor for.....
(use intended)

NAME _____

COMPANY _____

ADDRESS _____

COLUMBIA

CHICAGO
NEW YORK

BOSTON
CINCINNATI

MINNEAPOLIS



CHARLOTTE

CHEMICALS

ST. LOUIS
CLEVELAND

PITTSBURGH
PHILADELPHIA

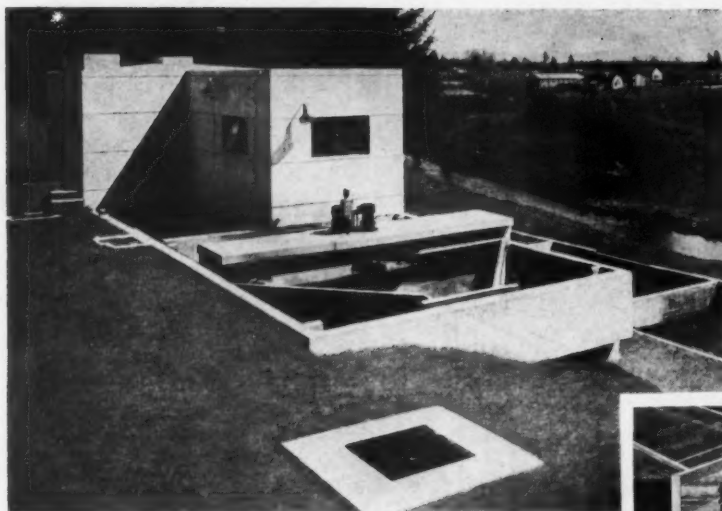
SAN FRANCISCO



PAINT • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

When writing, we will appreciate your mentioning PUBLIC WORKS



Many small communities and outlying plants, compelled on the one hand to purify wastes in order to stop pollution, but lacking ample supply of diluting water, have solved their seemingly insoluble difficulty by means of the Yeomans "Package" Aerifier activated sludge plant.

HIGH EFFICIENCY AT LOW COST

Here indeed is a highly efficient means of purification designed to fit the modest budget. In a single compact concrete unit of minimum dimensions you get aeration and final sedimentation; producing crystal-clear effluent at remarkably low over-all plant cost. Because there are no odors or flies, the plant can be located near habitation. Operation is simple, with supervision limited to routine check-up. All units are open for visual inspection. With its permanent concrete construction it is a plant that will perform efficiently for many years.

GOOD ENGINEERING

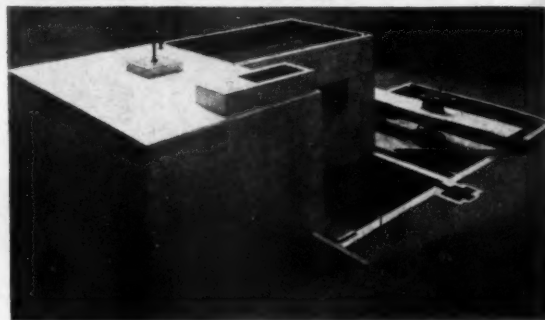
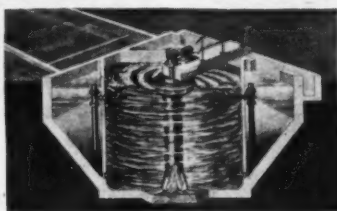
Each installation of the Yeomans Aerifier includes final adjustment, initial tested operation, thorough training of operators and continued counsel from an organization with a 50-year reputation for good engineering.

A Yeomans recommendation, based on data covering your needs, complete with construction cost estimates and application engineering, will be sent upon request.

HERE'S A "PACKAGE" TREATMENT PLANT THAT FITS A MODEST BUDGET

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Advance Planning for Public Works

MAJOR GENERAL PHILIP B. FLEMING

Federal Works Administrator

Prepared especially for Public Works Magazine

COMMUNITY foresight—which in the big cities may be called city planning or urban redevelopment or urban rehabilitation—is needed just as much in the little town. The small community experiencing the city-ward tug on its younger folk who imagine success is easier of attainment there, or that happiness is to be found in a succession of little fugitive excitements, needs this community foresight most of all.

There have been giant strides in an urban sense in the last 15 years and particularly since V-J Day when our soldiers came home from all parts of the world and demanded that their native towns do something about making living a pleasanter and more spacious experience. This was particularly true in regard to the facilities for public health and sanitation in the smaller towns and cities.

Out of more than 7,000 local public works projects for which Federal funds were advanced for planning, 1,496 were in cities of less than 10,000 population; and of these 592 were for communities of less than 2,500. The figures, which are reported by Commissioner George H. Field of the Bureau of Community Facilities, are significant in marking a trend toward a new "urbanity"—to use an old word in a new sense—in hundreds of America's smaller towns.

Our Needs For a Sound Program

The need for a stockpile of provident and fully-planned local public works ready to go into construction without delay in the case of an economic slump, loses none of its value because no recession or depression seems close at hand.

The Federal Works Agency Advance Planning Program was started in 1945 when Congress authorized the Federal Works Agency to establish a reserve shelf of local public

works projects from which, with the blueprints completed, a specifications written, and sites acquired, projects could be submitted immediately for construction contract bids when and if economic conditions warranted. It was intended to be a cushion against the recession expected with the cancellation of war-production contracts. Congress shut off the Federal advances when the recession failed to develop.

By type of work, planning advances were approved for the projects shown in Table I.

The estimated cost of a total of 7,073 approved projects amounts to \$2,454,854,547. Plan preparation has been completed on about three-fourths of the undertakings. When the Federal incentive program ended on June 30, 1947, there were left on the vine 2,272 applications having an aggregate estimated cost of more than \$1,000,000,000. Applications disapproved or withdrawn numbered 1,472.

Nothing is being done by the Federal government today to build up a backlog of fully-planned public works. Nor is any State or city, with few exceptions, so far as the records show, building a reserve to hedge against another depression—although the termination of Federal assistance

now places the responsibility for the maintenance of the reserve of public works squarely on these Governments.

Six Billion Backlog Needed

Most of the interested parties are agreed that a distinction must be made between deferrable and non-deferrable works because when or if a recession comes every town will be compelled to have a public improvement program. Otherwise communities must realize that they will be faced with business deflation and large-scale unemployment they can ill afford to carry. FWA estimates that a backlog of local and Federal works aggregating \$6,125,000,000 would be needed at the start of a depression to stabilize conditions in the construction industry alone.

This fact gave added significance to the Advance Planning Program. Indeed, I consider it the most important approach to the problem of public construction so far made in the United States. Unfortunately, the Program was terminated before its maximum benefits could be realized.

No one who understands the Program is opposed to it. Through the efforts of State and local governments, a sizable volume of non-Federal public works is ready for

(Continued on page 30)

TABLE I—TYPES OF WORK PLANNED

	Projects	Estimated Cost	Federal Advance
Highways, Roads, & Streets	434	\$80,265,708	\$1,955,299
Bridges, Viaducts & Grade Separations	61	75,804,549	1,071,327
Airports	53	33,763,116	781,805
Sewer, Water & Sanitation	3,391	1,075,100,922	22,867,181
Schools & Educational	2,090	601,238,383	17,512,242
Hospitals & Health	218	140,776,943	3,837,798
Other Public Buildings	493	229,328,135	6,300,744
Parks & Recreation	235	67,350,087	1,668,988
Miscellaneous Public Facilities	98	151,226,704	2,538,052

Lime Treatment of Tomato Canning Waste*

R. Y. LE VINE

Rutgers University, New Brunswick, N. J.

**This is a paper of the Journal Series, New Jersey Agricultural Experiment Station, Rutgers University, Department of Sanitation.*

CHEMICAL coagulation of tomato cannery waste can be expected to remove suspended and most of the colloidal matter, and consequently that part of the BOD which is not caused by soluble material. This treatment may be adequate, or it may be followed by some form of biological treatment. Since the waste has a relatively high BOD caused by soluble substances, chemical treatment alone cannot be considered as complete treatment.

Although considerable general information is available on chemical treatment of tomato wastes, including lime treatment, actual published data are scarce, particularly in respect to the types of lime used and to the volume and characteristics of sludges formed. Since the amount of lime used affects the cost of operation, and the volume and character of the sludge formed may determine the design of the treatment units, some results are presented to indicate what may be expected of chemical coagulation of tomato wastes.

Origin and Strength of Waste

The flow sheet (Fig. 1) shows the essential operations of a tomato can-

nery plant with "clean up" concentrated at the close of the day. The peeling belt and peeling room floor wash, together with the water sprays, is responsible for most of the waste during the day. The soaking and spray waste contain mostly inorganic matter and grit, whereas the other operations contribute juice, skin, seeds and pulp. Often the waste is screened to remove seeds, skins, and larger pieces of pulp. Hand cleaned screens produce waste with higher suspended solids, because slugs of waste are periodically allowed to reach the sewer.

A typical analysis of waste expressed in ppm, is as follows:

Total Solids	1920
Volatile Solids	1515
Total Susp. Solids	640
Volatile Susp. Solids	560
BOD	1335
Acidity (as CaCO_3)	688
Total Nitrogen	40
Organic Nitrogen	37
pH	3.9

"Synthetic" waste prepared from canned tomatoes, macerated and screened to remove seeds, and allowed to settle for 2 hours showed the following in comparison with actual waste (in ppm):

	Susp. Solids	BOD
Actual	194	1240
"Synthetic"	160	1240

The characteristics of the actual and "synthetic" wastes as affected by chemical coagulation are similar.

Chemical Treatment

Larger suspended solids can be readily removed by sedimentation. In chemical treatment the finely divided and soluble material is of greatest importance. A measurement of the extent to which waste may be treated by chemical coagulation is afforded by passage through a Seitz filter (a fine mat of paper), which removes all suspended and most of the colloidal matter. The removal of BOD by Seitz filtration corresponds to that which may be expected as the upper limit obtained by coagulation. This is illustrated by the following results obtained on a sample of rather strong sewage:

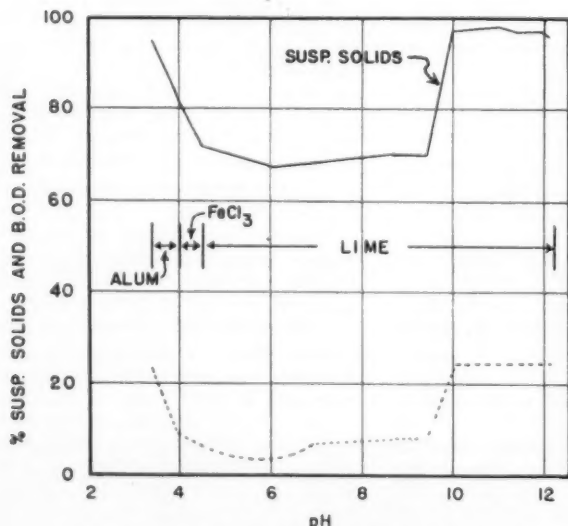


Fig. 3. Effect of pH on BOD and SS removals.

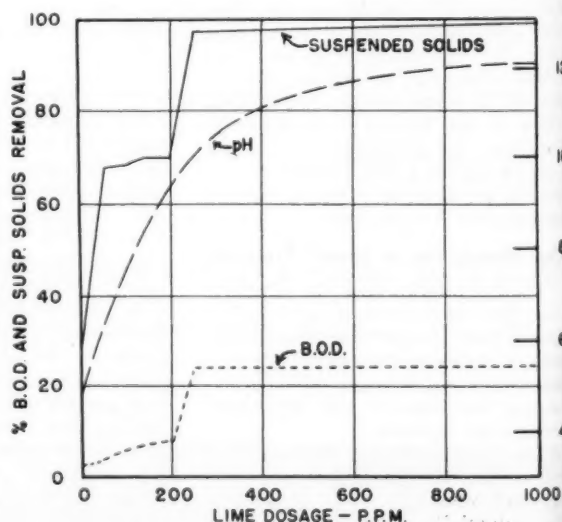


Fig. 2. Removals with high calcium hydrate.

	BOD ppm	% Removal
Raw Sewage	355	—
Settled for 24 hrs.	193	46
Seitz filtered	90	75

The Seitz filter effluent was crystal clear.

Results obtained in removal of BOD and turbidity by settling and Seitz filtration of tomato waste were as follows:

	ppm, BOD	ppm, Turb.
Original Waste	1360	170
2 hrs. settling	1240	80
Seitz Filtration	1010	0

From the results it appears that about 12% of the BOD is caused by settleable material, about 26% by the total suspended and colloidal matter, and 74% by the soluble material. The removal of BOD expected by chemical coagulation would not materially exceed 26%, corresponding to nearly 100% suspended solids removal.

Coagulation

Stirring and flocculation of waste without chemicals followed by settling causes a certain percentage of suspended solids and BOD reduction. Coagulation with lime results in increased removal of both suspended solids and BOD, this apparently occurring in steps until maximum clarification has taken place. As an illustration, the BOD and suspended solids removals obtained with various dosages of high calcium hydrate are plotted in Fig. 2. Optimum suspended solids removal occurred with a dosage of 250 ppm lime at a pH value of 10.0. Addition of larger quantities of lime had no further effect.

Experiments with various types of coagulants and combinations of coagulants are summarized in Table I, where the optimum dosages for maximum results are shown. It is apparent that 250 ppm of lime was at least as effective as 1000 ppm of alum. Reducing the amount of lime and substituting alum showed poorer results. Neither the optimum dosage of ferric chloride nor a combination of ferric chloride and lime produced better results than lime alone.

It appears that irrespective of the

TOMATO CANNERY FLOW DIAGRAM

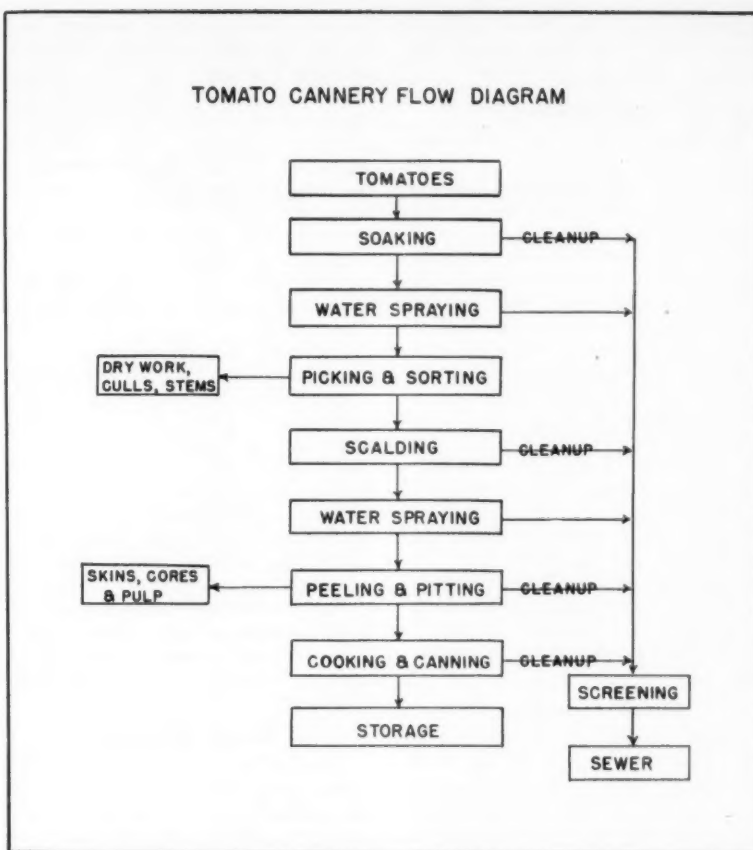


Fig. 1. Tomato cannery flow diagram.

coagulant used there is a relation between the pH values of the treated waste and the removal of suspended solids and BOD from the liquid. This is illustrated in Fig. 3, where the percentage removals are plotted against pH values. As in the case in sewage

coagulation, there appear to be two pH optima, one on the acid side (about pH 3.4-3.5) and the other on the alkaline side (about pH 10.0-10.5). Increasing the acidity or alkalinity beyond these pH values has no further effect on the removals of

TABLE I.—Effect of Coagulation with Various Chemicals at Optimum Dosages

Chemical	Dosage, ppm	pH	% SS Removed	% BOD Removed
Lime	250	10.0	97.4	24.0
Alum	1000	3.4	94.5	23.0
Lime and Alum	100 + 250	5.7	87.8	13.4
Ferric Chloride	150	3.9	87.6	13.9
Lime and Ferric Chloride	100 + 150	4.6	71.2	13.4

TABLE II.—Comparison of BOD and Turbidity Removals with Various Types of Lime

Lime Dose #/1000 gals.	pH	Ca Hydrate		Dolomitic Hydrate			Ca Quicklime			Dolomitic Quicklime		
		BOD ppm	Turbidity ppm	pH	BOD ppm	Turbidity ppm	pH	BOD ppm	Turbidity ppm	pH	BOD ppm	Turbidity ppm
Original	4.5	1360	170	4.5	1360	170	4.5	1360	170	4.5	1360	170
1.7	9.9	1185	30	9.1	1350	25	9.8	1260	22	9.0	1200	65
2.1	10.3	1130	*20	9.6	1190	22	10.2	1185	20	9.4	1200	45
2.5	10.5	1035	*20	10.0	1140	20	10.5	1130	*20	9.7	1110	23
4.2	11.4	1060	*20	10.6	1035	*20	11.2	1015	*20	10.7	1010	*20
8.3	12	1010	*20	11.6	1080	*20	11.7	1015	*20	11.4	1020	*20
16.7	12	1045	*20	12.0	1035	*20						

*Less than 20.

suspended solids and BOD. Low pH values would conceivably cause considerable corrosion.

Types of Lime

The results obtained indicate clearly that from the standpoint of purification and cost, hydrated lime is the best coagulant for tomato waste treatment. There are various types of lime on the market which could be used for the purpose. The question is, therefore, which type produces the best results and is most economical. A comparison of results, using calcium hydrate, calcium quicklime, dolomitic hydrate, and dolomitic quicklime, is shown in Table II. Removals of suspended solids and of turbidity was practically complete at optimum dosages with maximum BOD reduction of 25%. The quantities of lime required to reach optimum conditions varied from 2.5 lbs./1000 gals. for calcium hydrate to 4.2 lbs./1000 gals. for dolomitic quicklime. On the basis of quantity of coagulant required, calcium hydrate is the most economical.

Sludge Formation

Sludge is formed with all coagulants used. The sludge formed with lime settles rapidly, as indicated in Table III, where results are shown with equal amounts of lime added. It is evident that settling is essentially complete in 1/2 hour, but little compaction takes place during 2 hours. The result is that the settled sludge is rather thin, with a solids concentration of only 0.17%.

The actual amounts of sludge formed with various dosages of lime after one-half hour settling are shown in Table IV. It is of interest that the sludge volume decreases with increasing dosages of dolomitic hydrate and quicklime, whereas no decrease occurs with the calcium hydrate or calcium quicklime. The change in volume is apparently related to the nature of the floc formed. At the minimum dosage of calcium hydrate the floc is

large, allowing rapid settling, but interfering with compaction. With increasing dosages, the floc became smaller and lighter, with poorer settling but better compaction. With dolomitic hydrate and dolomitic quicklime the floc is more granular, with an apparent increase in granular structure when the dosage is increased. The minimum amount of sludge was formed with a dose of 8.3 lbs./1000 gals. of dolomitic hydrate and dolomitic quicklime, whereas a minimum volume of sludge was found with 2.5 lbs./1000 gals. of calcium hydrate. The sludge volume formed with the minimum calcium hydrate was about 15% more than with the maximum dolomitic lime dosages, but the dolomitic lime dosages required to produce equal clarification and BOD removal were about double that of calcium limes. Dolomitic lime dosages which produced about the same degree of purification as the calcium limes formed about the same volumes of sludge. Since a minimum dose with smallest quantities of sludge is desired, calcium hydrate appears to be best for the purpose.

Sludge Filtration

Vacuum filtration of the various types of sludges was attempted, but no satisfactory results were obtained even with dosages of lime as high as 33.4 lbs./1000 gals. of waste. The dolomitic lime sludges showed a tendency to filter better than the calcium lime sludges, probably because of the more granular nature of the dolomitic sludges.

Summary and Conclusions

Experiments made with various types and different dosages of coagulants to clarify and reduce the BOD of tomato canning waste show that lime was the most efficient and lowest in cost. With a lime dose of 4.2 lbs./1000 gals. reduction of 99% suspended solids and 25% BOD were obtained. Optimum clarification and BOD reduction occurred at pH values

of 3.4-3.5 and 10.0-10.5. Of the various types of hydrate and quicklimes used, high calcium hydrate was found best for purification and sludge volumes produced. Settling of coagulated material was rapid (1/2-1 hr.), but sludge volumes were relatively large, 160-180 gals./1000 gals. waste) resulting in a sludge with less than 0.2% solids. Vacuum filtration of sludge appears to be difficult and costly.

Acknowledgement.—The work reported was conducted under a grant of the National Lime Association.

Advance Planning for Public Works

(Continued from page 27)

construction; but it isn't large enough. The pent-up need for public facilities, delayed during the war years, and since V-J Day by priority for other more immediately needed construction, amounts to a six or a seven-year backlog of work vitally needed to protect health and serve public convenience. This requires a long range program and it must be operated on a continuing basis.

As I told a Senate Committee, only repayable advances had been made in this program and we thoroughly expect to get our money back. No advances were made unless we were positively assured the local resources were sufficient to pay for the project and that construction could begin within four years. No encouragement was given to any but the most useful and needed public works.

The reserve shelf of local public works set up by the FWA and administered by its Bureau of Community Facilities stands today in need of replenishment although some of the projects are still on the drawing boards. To perform its essential economic functions, such a backlog must be maintained at an effective level. It must be replenished as it is drawn upon to meet immediate needs. There are blueprinted plans in existence for local public works to cost several billion dollars; against these there are estimated public works needs during the next 10 or 15 years to cost approximately \$75,000,000,000. The maintenance of an adequate, live reserve must be a continuing business.

How the Smaller Town Benefits

Specifically, how does the smaller town benefit from an Advance Planning Program? Take, for example, a community with no engineer of its own and which needs expert advice in studying and planning water,

TABLE III.—Percent Reduction in Sludge Volume with Lime Dosages of 4.2 lbs./1000 gals.

Hrs.	Ca-Hydrate	Dol. Hydrate	Ca. Quick	Dol. Quick
1/4	80.5	83.5	80.5	80.5
1/2	83	84	82	81.5
1	83.5	84	82.5	82
2	84	84.5	82.5	82

TABLE IV.—Volume of Sludge Formed After 1/2 hr. Settling With Various Dosages of Lime in Gals. per 1000 gals. Waste

lbs./1000 gals.	Ca. Hydrate	Dol Hydrate	Ca. Quick	Dol Quick
2.5	160	—	—	—
3.3	170	170	185	—
4.2	170	160	180	185
6.3	175	140	180	145
8.3	180	135	180	135

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Benefits

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sewerage and sanitation facilities. It frequently happens that no funds are available for such studies until after the construction project has been financed.

Under the advance program, after study and approval of the application, 50 per cent of the repayable advance for planning was sent to the applicant. This provided funds to retain the engineering services needed. With final approval of the plans the remaining 50 per cent was paid.

Having blueprints and specifications ready the smaller community was able to go into the market and finance the project, generally more expeditiously and at better terms.

It should be remembered that FWA has consistently declined to approve applications for advance planning when the applicant failed to demonstrate ability to finance the construction of the proposed project, and no application was approved until the site of the project had been selected.

Methods used to finance the proposed public works for which plans have been completed, by source of funds, are: Bond issues, general obligation, revenue and special assessment, 38.3 per cent; cash on hand, 15.8 per cent, and other sources 45.9 per cent.

Action of the 80th Congress authorizing the Nation-wide Stream Pollution Program finds more than 1,300 communities with plans completed or on the drawing boards for sewage disposal or other facilities because of the Advance Planning Program. These projects run all the way from those involving millions of dollars in Chicago, in Allegheny County, Pa., and in the Bay Cities in the San Francisco-Oakland Areas, to hundreds of sewage disposal and collection projects running from \$30,000 to \$100,000 in the little towns.

Sand Loader Speeds Up Snow Removal

A. H. McCAFFREY

City Engineer, Johnstown, N. Y.

AFTER much discussion, we decided that a sand loader was needed in our City Engineering Department. In the past it had taken 4 to 6 men a half-hour to load a truck and send it out. The need for speed is paramount in sanding streets when ice forms on them. The quicker the sand trucks are on the job, the greater the safeguard to life and property.

We purchased a Model 522, Barber-Greene Bucket Loader in July, 1947. During the summer and fall this machine loaded sand and stone with either the mechanic at the City Barn or a truck driver operating it; no other labor required. It required only five minutes for the truck to take its load and leave.

In a small community, it is necessary to get as many uses out of a piece of equipment as is economically practical. In the back of our minds was the idea that when we secured our loader we could use it as a helper on snow removal. At corners where large piles of snow were pushed up, in parking lots and such places, it would be more economical than using our large loader. In case of severe storms it could be used as a helper to the big loader and thus make for faster clearing.

It was a question whether this would work. The question can now be answered, since the sand loader with slight changes works very satisfactorily.

The changes consist of putting chains on the wheels; bolting a 3/8" plate on each side of the scraper blade to confine the snow within the limits of the worm; and removing the follower plates back of the scraper blade, since there is not enough clearance for the wheels with the chains on. The addition of chains was necessary for maximum traction.

The operation of this sand loader as a snow loader is very satisfactory, since it loads snow as fast as it will sand. It will cut into a snow bank that has stood for several days and send pulverized snow up in the buckets and out the conveyor for either end or side loading. I have used it for casting in a parking lot where the snow can be thrown outside of the parking area. This can be done by starting at the center and working toward one side the same as is often done with a dragline.

In a small community where the business section is only a couple of blocks long, a loader of this type, with the aid of a few trucks, can readily keep the business section clear of snow in a most economical way. This can be done in the same way as it is done with regular snow loaders—windrow the snow from the sides to the middle of the street and pick up with the loader.

Snow clearance has become more and more necessary since the days when cars were put up for the winter. Today the public does not even wish to use chains. The economies of snow removal is not as yet appreciated by all of the people; but it is appreciated by City Officials who realize the congestion and slow-up of traffic caused by snow, especially in the business section.



The sand loader, with slight modifications, helps immensely on snow removal.



IMPROVING BOISE'S WATER SUPPLY

H. R. VINSON

President & Gen. Manager, Boise Water Corporation, Boise, Idaho

TO continue the established policy of maintaining an adequate reserve supply of water in advance of requirements, a new well for Boise was budgeted for drilling shortly after the first of 1947. A survey had been previously made to determine the best location from the standpoint of satisfactory production, desirable chemical characteristics, and nearness both to a sufficiently large main and the point of additional demand.

The drilling contract was let to A. E. Hosack & Son, well known drillers, who had sunk numerous wells for us in previous years. The well rig was moved in and a rough shelter erected as we had been having weather ranging from 10° below zero to 12° and 18° above. On Jan. 20, the new well was spudded in, 17 ft. of 16-in. hole was drilled, and the 16-in. casing driven in; next day 8 ft. was drilled; and the third day 14 ft., to a depth of 39 ft. for our first three days. At 135 ft. we entered a heavy clay formation into which we sealed the 16-in. casing.

Drilling the Well

From the first 5 ft. of hole, and after that at regular 5-ft. depths, samples of the soil formations were taken, placed in pint jars and labeled to show the depth. We wished this information for the study of future wells, and also to plot a complete picture of the well itself, as will be explained later.

After setting the 16" casing, we continued with the 16" bit, drilling open hole to enable us to gravel-pack the well. At 240 ft., when shale was encountered, some sloughing of the hole was noted, but nothing of a serious nature other than some worry and another gray hair or two. At 250 ft. a stratum of coarse gray sand was struck. This is nearly always good water bearing ground in this country, and it again proved to be the case as the water rose in about 10 minutes to within 3 ft. of the top of the casing which extended 4 ft. above ground.

Drilling was continued and, at a depth of 344 ft., water was flowing quite freely over the top of the casing. It was necessary to tap the cas-

ing slightly below ground level and insert a 6" line to carry off the water. Samples of the water were taken at various depths and analyzed. At 344 ft., the chemical analysis showed the results indicated in Table 1.

TABLE 1

pH	7.9
Calcium as Ca.....	11. ppm
Magnesium as Mg.....	1.4 "
Iron as Fe.....	.5 "
Carbonate as CaCO ₃	0.0 "
Bicarbonate as CaCO ₃	74. "
Chlorides as Cl.....	1. "
Sulphates as SO ₄	5. "
Fluorides	0.6 "
Hardness, calculated as CaCO ₃	34. "
Phosphates	0.0 "
Temperature	53°F

We then started placing the 10" slotted casing and continued upward until we reached the top of the water bearing strata, giving us 157 ft. of slotted casing. After placing this, we continued on up with 10" unslotted casing through the clay formation and up inside the 16" casing to a foot above the top of the 16" casing to permit gravel packing of the well.

Gravel Packing

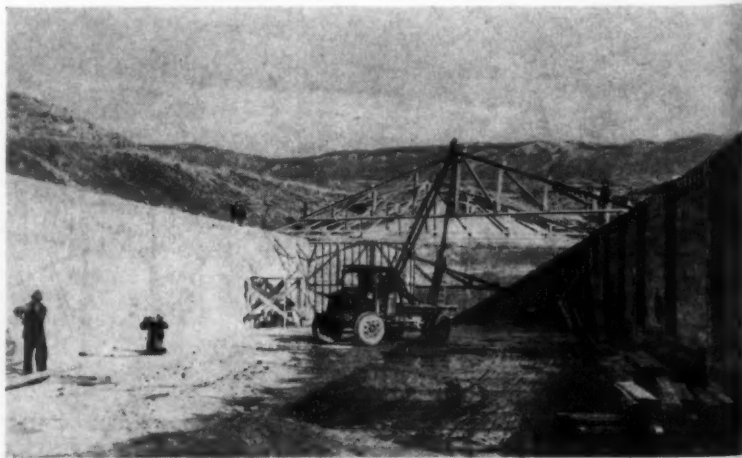
Gravel packing was accomplished by shoveling round 3/4" washed gravel into the space between the two casings. The gravel must be

round, as the sharp edges of crushed gravel tend to work into the slots of the casing and to reduce the flow into the well. The gravel was sterilized with HTH before being placed and also while it was being placed. Placement was continued until the gravel extended about 5 ft. up into the 16" casing. Then the well was given a steady swabbing for 8 hours, drawing in loose sand and settling the gravel into place. The 10" casing was then removed by unscrewing a left-hand coupling where the 10" entered the bottom of the 16", and we were ready for the test run.

The test run was continued for 48 hours, pull-down being recorded at each hour; and after pumping was stopped, recovery of the well was noted. Well production was charted at approximately 700 gpm. or a little over 1 million gallons per day. The summer run bore out quite closely the results of our tests in regard to production, satisfactory operation and improvement of service.

Another Well Is Sunk

With continued heavy construction of homes and expansion of industry, it was deemed advisable to drill still another well. The contract was again let to A. Hosack & Son, and drilling



Interior of enlarged reservoir, showing erection of the steel framework for the roof.

of an 18" well was started in September. Satisfactory footing in heavy shale was found at a depth of 126 ft., and drilling was continued; we finally struck one strata of sand where it was necessary to set a 12" casing until we were through drilling, then pull the 12" casing, replace the 18" bit, and shear off the side. This was accomplished without the sand strata giving us any more trouble. The well was sunk to a depth of 481 ft., with 355 ft. of slotted casing. Tests indicated a conservative production of 2 mgd. The test for maximum production could not be run due to the problem of disposal of the water, but sufficient stabilized points were obtained to enable us to plot a good production chart.

Analysis showed a soft water, hardness of 59 ppm, low in iron, .08 ppm., magnesium 1.5 ppm, and temperature of 58° F.

This well is so located that, if need be, the water may be fed into the system in three different directions, though present plans are for installation of 1400 feet of 12" cast iron pipe to augment the supply to the so-called Bench area where construction of a 2,000,000-gallon steel reservoir is under way to service this rapidly growing area.

In the earlier part of the article mention was made of samples being taken of the various strata drilled through. After the wells were completed, tested, and found satisfactory, a visible log was prepared. This was done by using a long glass tube, approximately 1" in diameter. Starting at the bottom of this glass tube, comparable to the bottom of the well, a small portion of the sample was inserted and a visible well log was constructed to scale, using samples that had been taken every five feet or whenever the strata changed. As a result, when we were through and the glass tube was mounted on a panel, a complete picture of the well strata was available for study and reference.

With the two wells drilled during 1947, the maximum production will be approximately 14,000,000 gallons per day, all from underground sources, with a reservoir storage capacity of 6,100,000 gallons after one reservoir was enlarged.

Adding Storage Capacity

Our storage was increased in the fall of 1947 by a half million gallons. We had been studying for some time a reservoir of 500,000 gallons capacity which was of brick construction with an arched brick roof. It had been in service nearly a half a



Test run on the second well. Mr. Vinson at left; S. M. Walsh, Outside Supt., at right. Weather: Cold.

century and the bricks in the roof showed a tendency to drop; so it was decided to remove the roof, and raise the side walls and ends to double its capacity.

Several methods were studied for removing the roof, from working with bars and sledges from platforms over the roof to a clam-shell bucket. Final decision was to use a drag line and after the roof was down to use a hoe shovel to load trucks.

With the roof down, work progressed quite rapidly with setting of forms and pouring of cement for side walls and one end. The other end remained open until all steel work was in place. Before the walls and ends were completed a close inspection revealed that the old concrete floor was not thick, so a heavy layer of concrete was laid down, care being taken that a perfect bond was secured with the walls and ends, and that all corners were carefully checked for water tight joints.

A roof of corrugated aluminum was used, with bolts being inserted from outside in and nuts placed on them; also screws from inside out, the screws extending through approximately one-eighth of an inch. The screws from inside out served two purposes, first and primarily they tied the sheets more securely to the overlapping plate; secondary, they will have a discouraging effect on anyone tempted to slide down the bright shiny roof.

The reservoir was filled with heavily chlorinated water, allowed to stand forty-eight hours, checked for loss or leakage and drained.

Continuing the policy of keeping in advance of requirements, the company is at present constructing a steel reservoir of 2,000,000 gallon capacity at ground level, but at an elevation well above the city and the territory it serves.

Experiments at Detroit's Sewage Treatment Plant

For a period of 15 days in March, 1947, approximately 20% of half of the collected raw sludge was returned to the four west sedimentation tanks of the Detroit Sewage Treatment Plant for re-settling. The four east tanks were operated as the control for comparison. It was hoped that sludge recovery would be improved as had been experienced at Denver. However, means of providing aeration and mechanical flocculation were not immediately available, as used at Denver, so the experiment was discontinued until such time as these could be provided. No beneficial results were noticeable during this short trial period.

The filtering of heated sludge was given a 43-day trial during May and June. Live steam was introduced into the sludge sump prior to conditioning. Various increases of temperature were tried. Slight differences in dosage percentages were noted—sometimes below and sometimes above those of the control filters—but never great enough to provide any conclusions or enough to compensate for the use of steam. Uniform production of a good filter cake resulted to a greater extent than with unheated sludge.

Stage Construction of

BITUMINOUS CONCRETE HIGHWAYS

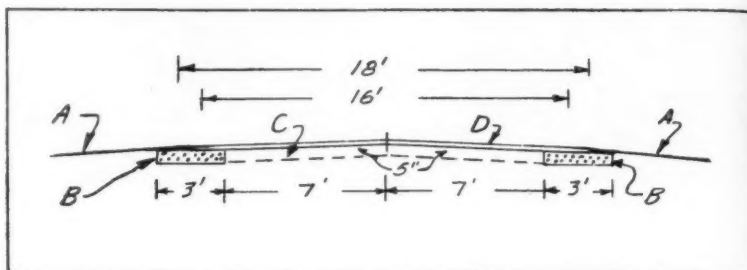
Alan N. Buck, Superintendent of Highways, Macon County, Illinois

IN accordance with our stage construction policy which we have been developing from a planned program dating back to 1938, this department recently completed a section of 6.65 miles of Illinois sub-class C-6 modified pavement. This has several features that make it an unusual job.

A word about our thinking in connection with stage construction may be of interest. This county is in the center of a rich agricultural area in central Illinois; while the land is highly productive, it is far from satisfactory as a natural geological foundation for highway purposes. Therefore, our first job was properly to grade and drain our road beds. This work was followed by placement of crushed stone and gravel wearing surfaces and these were maintained thoroughly by proper blading and addition of metal until all apparent grading deficiencies were corrected. In many instances it was advisable to add calcium chloride, and this provided a dustless surface as well as consolidated bases. Then followed low-type bituminous tops, such as surface treatments and road mixes. It was possible thus to improve many miles and at the same time provide dustless all-weather surfaces. During this stage, additional weak spots developed in the bases, and these were corrected. Finally, we were ready for higher type tops and as sections are ready and funds are available, these higher type bituminous surfaces are constructed, all as planned and in order of importance to traffic demands and other economic reasons.

Making Improvements

The particular section discussed here is ten miles long, and connects two of the outlying cities in the county. The road was graded and drained in 1932 to accepted Federal standards. One section of 3.35 miles was gravel surfaced 20 feet wide in 1933 and the remaining 6.65 miles was gravel surfaced 16 feet wide in the same year. All of the ten miles was well maintained as gravel and in 1936 an A-1 surface treatment of



Section of highway, showing: A—shoulder area to be made of windrowed material by county forces; B—widening courses; C—existing 5" gravel surface; D—2" bituminous surface. Dimensions show how surface was widened from 16' to 18'.

MC asphalt and aggregate was applied. The whole ten miles was sealed as above in 1940 and regular patching, base correction and drainage improvements carried on, so that by 1946 the road had a minimum 5-inch thickness and no weak spots. At that time we built an 18-foot, C6 modified 2-inch thick top on the 3.35 miles of 20-foot gravel.

About a year later we decided to widen the base of the 6.65-mile section and to resurface it with the C-6 modified bituminous concrete. The detailed specifications of the gravel used in widening were:

100%	Passing	1"	Sieve
80-100	Passing	3/4	Sieve
65-100	Passing	1/2	Sieve
40-60	Passing	#4	Sieve
30-50	Passing	#10	Sieve
18-30	Passing	#40	Sieve
8-15	Passing	#200	Sieve

(#40 sieve P.I. of 3-14)

A 3' wide by 7" deep trench was cut, the inside of the trench being 7' 0" from center line of road. Thus one foot of width was removed, the theory being that this was the weakest part of the old base and should be replaced. The cross section herewith shows this in detail.

The detailed specifications for the C-6 modified plant mix bituminous surface used are as follows:

Passing	1"	Sieve	100%
Passing	3/4	Sieve	95-100
Passing	1/2	Sieve	70-90
Passing	#4	Sieve	45-65
Passing	#10	Sieve	40-55

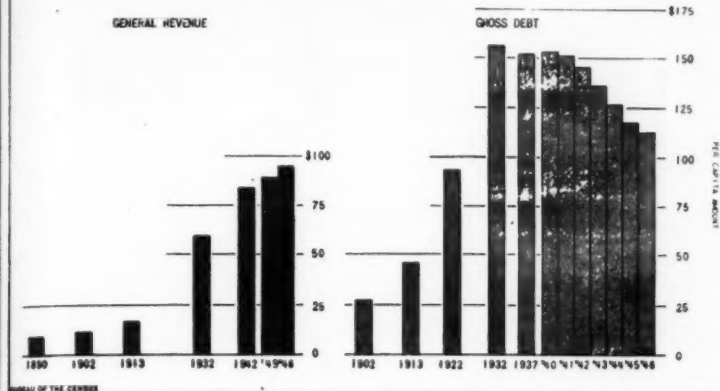
Gradation of aggregate passing #10 sieve	
Passing #10 retained on #40	—50—75%
Passing #40 retained on #200	—15—45%
Passing #200.....	5—13%
Bitumen	4—6%

The standard C-6 specification calls for "medium curing asphalt or tar" but we modified the specification to read "Asphalt PA-2 of 85-100 penetration shall be used in preparation of cover coat mixture." It was felt that since we had used this PA on three previous jobs with considerable success, it should be used here. We feel that, with thoroughly stabilized bases, an asphalt of this type is a good investment. There is no difference in cost; in fact comparison has developed that it is slightly less expensive. We also feel that this type of pavement, being the last step in our stage construction, will require less maintenance than one made with MC's or SC's. We also like the additional beam strength of this type.

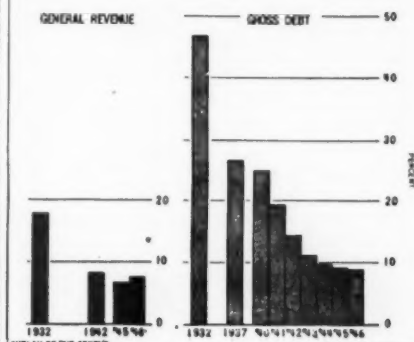
Bids were taken and with the following results: Collins Construction Co., Decatur, Ill., \$105,897.75; Sangamo Construction Co., Springfield, Ill., \$112,405.00; Champaign Asphalt Co., Champaign, Ill., \$113,727.50. The successful bidders unit prices were as follows: Excavation, 90¢ cu. yd.; gravel widening, \$4.05 ton; subclass C-6 Mod., \$8.75 ton (average haul 16 miles); prime coat, 15¢ gal.

The contractor sublet the gravel
(Continued on page 36)

PER CAPITA GENERAL REVENUE AND GROSS DEBT OF STATE AND LOCAL GOVERNMENTS: 1890-1946



GENERAL REVENUE AND GROSS DEBT OF STATE AND LOCAL GOVERNMENTS, AS PERCENTAGES OF NATIONAL INCOME: 1932-1946



STATE AND LOCAL FINANCES

CENSUS statistics on the finances of state and local governments cover a period of almost a century. A report just issued by the Bureau of the Census and sent us by A. W. Von Struve, Information Specialist of the Bureau, is entitled "Historical Review of State and Local Government Finances." Census data on governmental finances have been closely comparable within, but not between, three periods—pre-1937; 1937 to 1941; and after 1941. The aim of the report is to link these three periods in such a manner as to provide the maximum possible amount of comparable historical information for the entire period.

The review contains 15 charts, several of which are reproduced here

—some of them slightly modified because of space considerations. These figures do not need text to explain their meanings. There are also 23 tables of statistical data in the review, some of which will be summarized briefly.

Expenditures for operation, not including capital outlay, of state and local governments by function and by the type of government for selected years (Table 6 of the review) show the growth in expenditures since 1890. Total expenditures for state and local governments in 1890 amounted to \$478 million; in 1902 to \$781 million; in 1913 to \$1,165 million; and in 1942 to \$7,216 million. During the same period, expenditures for county governments rose

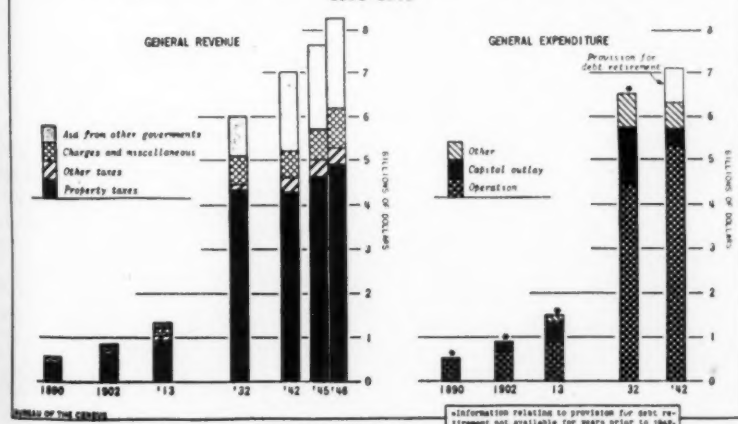
from \$166 million to \$1,234 million; and for city corporations from \$325 million to \$2,226 million. State and local governments spent \$84 million on highways in 1890 and \$807 million in 1942; county expenditures for highways rose from \$29 million to \$244 million in the same period. For sanitation and health, cities spent \$26 million in 1890 and \$207 million in 1942.

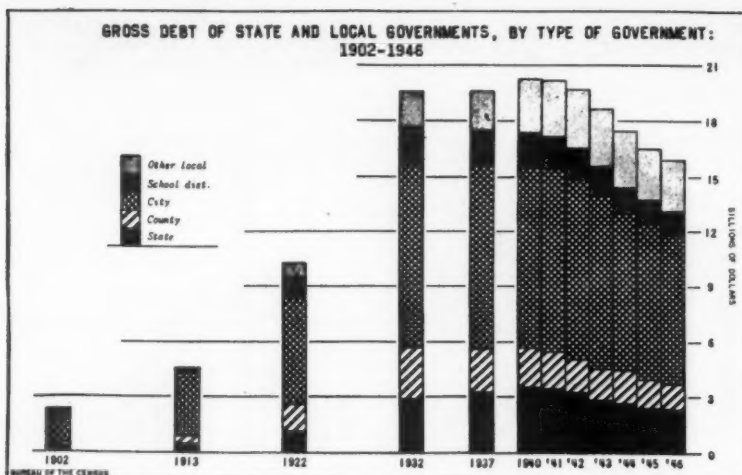
Debts of state and local governments decreased steadily from 1940 to 1946 and were lower in 1946 than they were in 1932. These data are shown in one of the accompanying charts; and the relation of gross debts to national income is shown in another chart, which illustrates how greatly this percentage has been reduced.

In cities of more than 100,000 population, general revenue totalled \$2,936 million in 1946, an amount about the same as the average annual revenue since 1927. Of this, \$1,413 million was derived from property taxes; and, again, the same proportion generally holds for other years. If anything, the proportion of revenue arising from property taxes has been decreasing. In connection with these data, the years prior to 1940 are on a somewhat different basis, as overlying portions of local governments were included; also there were fewer cities this size. Since 1940, 92 cities have been included in this category.

In these same 92 cities, total expenditures for operation and capital

GENERAL REVENUE AND GENERAL EXPENDITURE OF LOCAL GOVERNMENTS: 1890-1946





outlay ranged from \$1,535 million in 1940 to \$1,699 million in 1946. Expenditures for highways were \$131 million in 1946; and for sanitation \$141 million.

The total 1946 revenue of Group I cities (these having populations over 1 million) was \$1,113 million; general expenditures were \$1,137 million; net long-term debt \$3,062 million; and gross general debt \$1,559 million. Aside from the reduction in debt (net, from \$3,513 million to \$3,062 million) these figures generally apply to the four preceding years also. For Class II cities (populations 500,000 to 1,000,000) general revenue was \$452 million in 1946 (up from \$399 million in 1942); general expenditure was \$445 million (up from \$395 million in 1942); and debt was down (net long-term from \$729 million in 1942 to \$566 million in 1946; and general debt from \$537 million in 1942 to \$381 million in 1946. Class III cities (250,000 to 500,000) with a total revenue of \$409 million in 1946; Class IV cities (100,000 to 250,000) with a total revenue of \$363 million in 1946; Class V cities (50,000 to 100,000), \$299 million; and Class VI cities (25,000 to 50,000) \$280 million—all showed the same trends.

The 397 cities having 1940 populations over 25,000 spent \$2,150 million for operation in 1946, which represented a continued fairly steady increase over the 1942 operating expenditure of \$1,897 million. Of this \$165 million went for highways and \$180 million for sanitation. Capital outlays included \$63 million for highways and \$36 million for sanitation. These were all increases over the preceding years.

County governments had a total general revenue, exclusive of borrowings, in 1946, of \$1,720 million, of which \$889 million came from prop-

erty taxes. Total general expenditures were \$1,696 million, of which \$1,365 million went for operation. Of this, \$292 million was spent on highways (plus \$45 million capital outlay), and \$5 million for sanitation. The comparable 1942 figures in the same order as above were: \$1,650 million total general revenue; \$893 million property tax; \$1,629 million total expenditure; \$1,234 million for operations; \$244 million for highways; \$2 million for sanitation; and \$56 million capital outlay for highways.

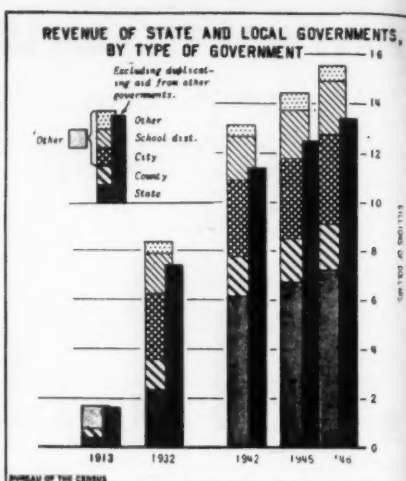
Bituminous Concrete Highway Construction

(Continued from page 34)

widening, the gravel being obtained from a local gravel pit. The C-6, modified, was placed at the rate of about 500 tons per day (2" thick by 18' 0" wide, or approximately 1000 tons to the mile). The initial compaction and smoothing was done by an accepted finishing machine and this was followed by two rollers of 5-8 ton weight. The temperature limits of the delivered mix was 225° F. to 300°. Following completion of the surface course the county bladed the excavated material back to the pavement and completed this as the shoulder work. The county then placed a white traffic line on the pavement.

This job was built as a Federal Aid Secondary and was financed $\frac{1}{2}$ Federal, $\frac{1}{4}$ State and $\frac{1}{4}$ County. The plans, specifications and construction were inspected and approved by both the P.R.A. and State engineers in addition to our own inspection. The county provided both plant and road inspection and the county share of cost was paid out of Motor Fuel Tax revenue.

Some of our observations following



construction are that perhaps it would be better to stabilize the widened strip of gravel base by either traffic binding or addition of bituminous materials. It is our feeling that it may be the paving was put over the gravel widening a little too soon.

Diatomaceous Filters for Swimming Pools

The diatomaceous earth filter, developed during the war, has been used at several swimming pools with promising results. Based on limited experience to date, this filter appears to have some advantages over sand and gravel filters. These are: decreased space and weight; no coagulant is used; extremely little wash water is needed; operation and maintenance are less complicated.

In operation, the diatomaceous earth filter-aid is mixed with the filter influent at the start of a filter run, and in some operations small amounts are continuously added during filtration. The filter-aid is deposited on cylindrical porous filter elements in the pressure filtering unit. The dosage is about 2.0 ounces of filter-aid per square foot of filter surface. Standard filter rate appears to be 3 or 4 gallons per square foot per minute but this may vary with the type of water and filter-aid used. Normal flow in the unit is upward. Filtering continues until influent pressure reaches 35 to 50 pounds per square inch, at which time flow through the filter is reversed, washing dirt and filter-aid to waste.

The length of filter run depends on the turbidity of the pool water. Filter runs of 10 to 12 hours are obtained on fairly clear pool water.

From "Swimming Pool Operation," Circular No. 125 of the Illinois Dept. of Public Health.

Elevated Tank Reduces Pumping Costs and Improves Fire Protection

X. D. MURDEN

Superintendent, Portsmouth, Va., Water Department

THE water supply of the City of Suffolk, Va., which is owned and operated by the City of Portsmouth, grew as most water plants do, as necessity demanded. The pumping station is located on the opposite side of the town from the factory district and sufficient larger size mains to maintain pressures for combating large fires are lacking.

Storage on the distribution system included one standpipe 8' in diameter and 140' high located adjacent to the pumping station. The capacity of this standpipe was 53,000 gals. As the demands on the water system increased, it became necessary to meet the requirements for a larger reserve with an elevated tank having a capacity of approximately one-half million gallons.

We prepared specifications covering

the erection of an elevated tank with a capacity of 500,000 gals, 65' in diameter and 25' high, elevated 100' above the ground, and supported on eight tubular columns.

We advertised for bids covering construction of foundation, tower, tank, altitude valve and other piping extending 3' outside the valve vault. Two bids were received and a contract was awarded to Pittsburgh-Des Moines Steel Company for the complete job including cathodic protection. The contract price was \$90,200 and the only extra was \$1,080 covering the cost of painting the interior of the tank with red lead. Construction was started July, 1946, and the tank was placed in service July 20, 1947, after filling, chlorinating, draining and refilling. The construction of this tank has proven beneficial

to the whole system, with much better pressures constantly maintained for domestic and fire service and with lower pumping costs.

The reduction in cost is the result of operating the pumps under the best conditions and shutting down for six hours during the day, refilling the tank at night, on the off peak power rate. Before construction of the tank it was necessary to choke the discharge valve on the pump to control pressure with proportionate high power cost.

The pumpage to the system averages 1 to 1.25 mgd.; therefore, we could operate safely for several hours, if a power failure occurred, without utilizing standby equipment.

The tank is on the opposite side of the city from the pumping station and is connected to the system by a 12" main connecting to a 16" main from the pumping station.

In this business, continuity of service, safety of supply and purity of water are essential and the construction of an elevated tank means much to assure the attainment of these goals.

A Sewer Repairing Wrinkle

Men who lay sewer pipe being what they too often are, a pipe is sometimes not sent fully "home" in its joint, and the jute gasket calked into the back of the bell is forced out of the joint to drop in a loop from the top of the sewer. If it is a small sewer—6" or 8"—this loop is apt to catch some floating object after the sewer has been put into service and so cause the beginning of an obstruction. But getting it out after the sewer has been back-filled is not so easy. Using rods and a root cutter may do it, or may only pull more of the gasket into the sewer and weaken the joint. A method that has been used successfully is to fasten a candle on a small piece of board to which a long cord is attached; light the candle and float it down the sewer until it is right under the loop and hold it there until the loop dries and burns. If there is no sewage flowing, place a dam at the manhole next below and run water into the sewer through a hose. The heat from the candle will not be sufficient to crack the pipe, and it will furnish light to locate the loop by.

Isolated Sewerage Costs

The question of how far out of a village or development area sewers are to be extended to pick up fringe or isolated houses presents a problem. I have used as a guide the estimated cost. Where this is over twice the average cost per house (within the district) the extension is not made unless there are special reasons.—A. Hutchings, Engineer and Surveyor, Cuckfield R.D.C., in *Contractors Record* (England).



500,000-gal. toro-ellipsoidal type elevated tank at Suffolk, Va. Tower height 100 ft.; head range 24' 8".

How to Design

SANITARY SEWERS FOR A SMALL COMMUNITY

KENNETH W. COSENS

Asst. Professor of Sanitary Engineering, University of Texas

This is a step-by-step description of the procedures in designing a sanitary sewer system for a small community. It includes illustrative drawings of the various steps employed in design, and it demonstrates a practical method of approaching the problem.

FOR the purposes of illustration, it is assumed that a village of about 1500 population is to be provided with sanitary sewers. The terrain is fairly level. The treatment plant design will not be included in this article, but provision will be made in the design of the sewer system and the location of the sewer outfall to facilitate the construction of the treatment plant.

The first step is to procure maps of the area. In order to avoid unnecessary surveys, the engineer should canvass all local sources for maps. Of particular value, because of the survey work otherwise necessary, are maps showing street locations and lot and block numbers. Such maps may sometimes be procured from the Village offices, real estate agents, or local surveyors; or from the local or county tax office. If such maps cannot be obtained, the engineer must prepare his own, which will often necessitate extensive surveys and the collection of data on property locations and lines. It is important to check all maps prepared by others to assure that they are sufficiently accurate for the use to which they will be put.

U. S. Geological Survey maps are available for many areas of the country. These may be obtained from map stores in many cities; from the USGS offices usually located in the various state capitols; or from the Government Printing Office in Washington. The scale of these maps is so small (usually 1 inch to the mile) that they are of limited value in design, but they are helpful in showing topographical features and in the general planning. The information on them must be supplemented by levels run on the streets to be sewered

and along the lines of those sewers which do not follow streets.

General topographical features on which information must be obtained include: The location of brooks, creeks, sloughs, ponds and lakes; the limits of railroad rights-of-way; paved streets and, where the pavement does not extend from curb to curb, the limits of the pavement; the types of pavement on the various streets; underground structures, including water mains, telephone conduits, gas mains and storm drains; the location of rock, especially along the lines of the sewers; and quicksand, swamps, ground water and other conditions unfavorable to or likely to affect construction. Other necessary data are enumerated under the appropriate headings below.

Fig. 1, which shows for the assumed conditions the street pattern, the location of buildings and other improvements, pavements and water mains, is a typical map of an area to be sewered. Lot and block numbers are shown in most areas, and where they are not shown, the properties have not been subdivided. It will be assumed that this map represents the community for which the sewer system is to be designed.

State Requirements

Plans for a sewer system must be submitted to the State Board of Health for approval. The construction work will usually be done by contract. The plans, therefore, should include all information necessary for these purposes, such as: (1) A general map of the village or the sewer district, showing the proposed sewer lines and also the adjacent areas likely to be served by sewer extensions from the system at some future time; (2) plans and profiles

of all sewers to be constructed; (3) details of such appurtenances as manholes; (4) a full report on the system, containing such data as are necessary to provide a complete understanding of the bases of design; and (5) an estimate of the cost of construction.

Lettering and drawings should be of such size as to be clear and understandable. Invert elevations of sewers and manholes should ordinarily be given to the nearest 0.01 ft. The sizes, lengths and slopes of all sewers, both existing and proposed, should be clearly shown.

In general, sewerage systems should be designed for an estimated population 30 to 50 years in the future. Lateral and sub-main sewers should usually be designed so that, when running full, they will have capacities of about 400 gals. per day per person tributary to them; and main sewers about 250 gals. These requirements are not uniform among the states, and it is best to obtain detailed information from your state sanitary engineer.

The Plans

The general plans may be drawn to a scale not greater than 100 nor less than 300 ft. to the inch. Designs for small systems may well be drawn to the 100-ft. scale; and if the working maps are on this scale, prints of them can be used for the preliminary layout of the system. If the community is large enough in area to require more than one sheet, the boundaries of each sheet should be well-defined "match" lines, which will match lines on adjacent sheets, so that the sheets for any or all parts of the area can be readily assembled. "Match" lines are shown on Figs. 1, 2, 6 and 7 herewith. Preliminary sewer profiles may use a vertical scale of 10 ft. to the inch. The final construction prints require more detail and are frequently drawn to a scale of 50 ft. to the inch horizontal

and 5 ft. to the inch vertical, especially in fairly level areas.

Making the Surveys

Much of the information needed for design will have to be obtained by a survey party; and this will normally involve both transit and tape and level work. It is desirable that levels be tied into USGS benchmarks. If there is none in the neighborhood, an assumed datum must be established, and this should be sufficiently great that no negative or minus elevations will be recorded or used in the work, for these constitute a fruitful source of errors. In any case, several benchmarks should be established and tied in with level circuits. Profile lines must then be run on all streets and other places where sewers are to be located. Elevations should be taken at all street intersections; at 100-ft. points intermediate; and at all marked changes in grade. These elevations should generally be taken along the center line of the street, but may be taken

should be and under- of sewers inarily be 1 ft. The s of all proposed,

systems estimated in the fu- in sewers d so that, will have s. per day hem; and als. These rm among to obtain your state

be drawn n 100 nor n. Designs be drawn the work- prints of preliminary ne commu- rea to re- sheet, the should be which will sheets, so all parts assembled.

on Figs preliminary a vertical The final more de- drawn to a horizontal

During the course of the survey, all dwellings, stores and other structures that may require sewer service should be located, although this can be done at a convenient later date if desired. Precise location of such buildings is not necessary, but the depths of basements or cellars must be taken quite accurately so that the depth of the sewer necessary to serve them can be determined.

Other Important Data

Industrial plants, such as milk or fruit or vegetable canning plants or other installations which may discharge a considerable volume of waste to the sewers should be noted, and accurate data obtained on both the total daily and the maximum rate

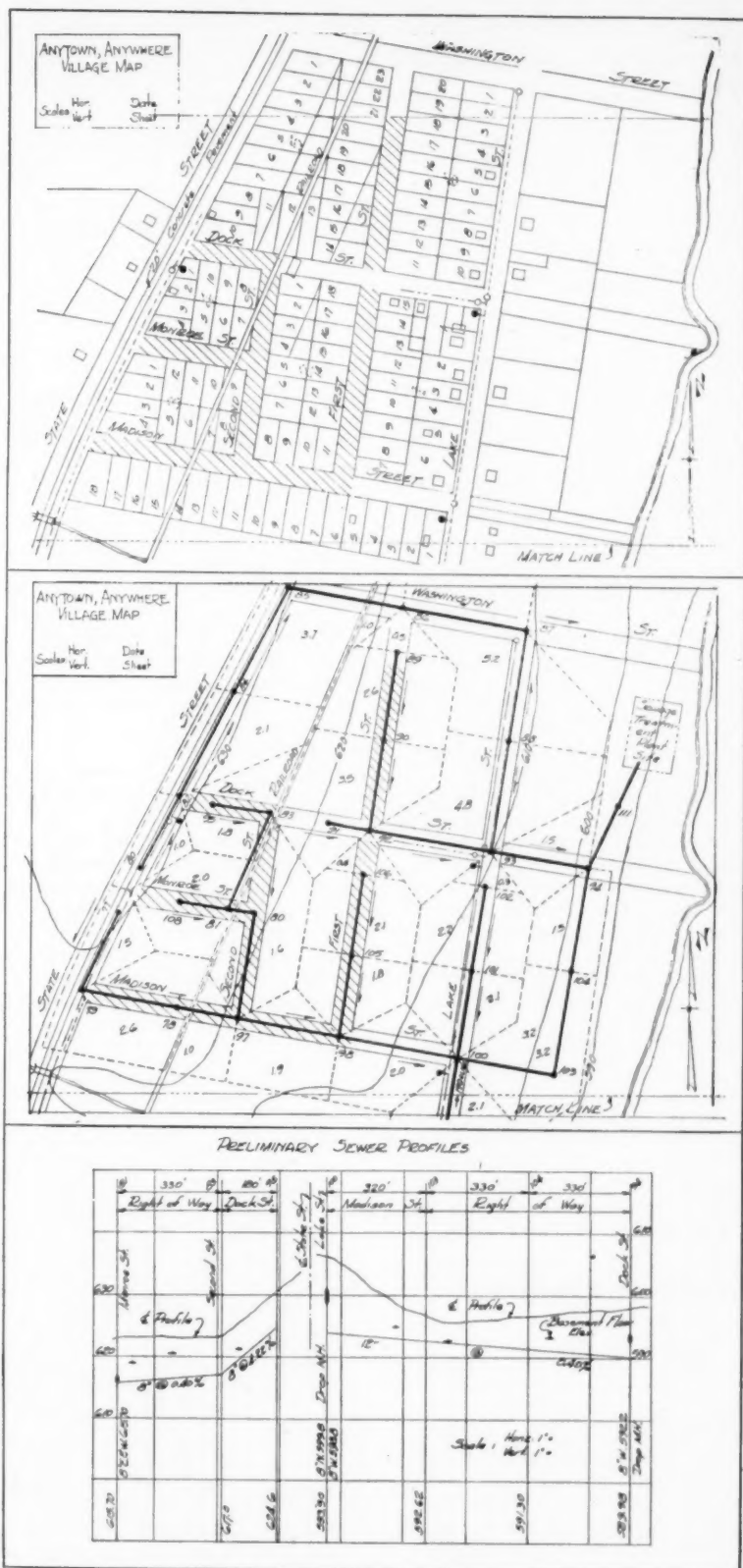


Fig. 1, top, the street pattern. Fig. 2, middle, the layout of the sewer system. Fig. 3, bottom, preliminary profiles of some of the sewers.

TABULATED DESIGN DATA

Street	From M.H. No.	To M.H. No.	Length Ft.	Tributary Area		Maximum Rate of Sewage Flow c.f.s.	Diameter of Sewer Inches	Capacity Full c.f.s.	Velocity Ft./Sec.	Slope %	Limits	
				Increase in Acres	Total Acres						From	To
State	77	79	275	1.5	1.5	.0107	8	1.2	3.5	1.36	Monroe	Madison
Madison	79	78	310	2.6	4.1	.0291	8	1.3	3.8	1.51	State	Second
"	78	97	200	1.0	5.1	.0362	8	1.3	3.8	1.51	"	"
Dock	95	83	190	1.8	1.8	.0128	8	2.5	7.0	4.22	State	Second
Right of Way	83	81	345	0	1.8	.0128	8	0.7	2.0	0.40	Dock	Monroe
Monroe	81	80	90	2.0	3.8	.0271	8	1.0	3.0	0.88	State	Second
Second	80	97	340	1.6	5.4	.0383	8	1.0	3.0	0.88	Monroe	Madison
Madison	97	98	330	7.0	12.4	.0882	8	1.3	3.8	1.51	Second	First
First	106	105	260	2.5	2.5	.0178	8	0.7	2.0	0.40	Dock	Madison
"	105	90	260	1.8	4.3	.0305	8	0.7	2.0	0.40	"	"
Madison	90	100	390	14.4	18.7	.1330	8	1.6	4.7	2.28	First	Lake
Lake	102	101	275	2.5	2.5	.0178	8	0.9	2.8	0.80	Dock	Madison
"	101	100	280	2.1	4.6	.0327	8	0.9	2.8	0.80	"	"
Right of Way	100	103	310	88.7*	193.3	1.372	12	2.1	2.8	0.40	East of Lake St.	
"	103	104	335	3.2	196.5	1.392	12	2.1	2.8	0.40	"	"
"	104	94	335	1.5	198.0	1.406	12	2.1	2.8	0.40	"	"
"	94	111	220	24.9	222.9	1.582	12	2.1	2.8	0.40	"	"
"	111	→	150	0	222.9	1.582	12	2.1	2.8	0.40	"	"

*A considerable amount of this area lies beyond the border of the map shown

*A considerable amount of this area lies beyond the border of the map shown.

Fig. 4. One method of handling the design data.

of discharge. The village water consumption rates should be investigated. Many communities are metered; in some the water is pumped; there are few which have no facilities that will permit a reasonably accurate estimation of the flow. In small communities, sewer sizes are usually fixed by the minimum size of the pipe it is desirable to use—normally 8-inch. However, the probable volume of flow from all industries should be checked carefully. Consideration should be given to the type of ground through which the sewers are to pass. Rocky areas will greatly increase the cost of construction and should be avoided if at all possible. Areas with high ground water, below which the sewer must be constructed, are likely to cause considerable infiltration, since it is difficult to construct a sewer which will remain tight for an indefinite number of years. Ground water may also materially increase construction costs, as will soft ground that must be sheeted.

Preliminary Considerations

Before the main outfall sewer can be designed, the site of the treatment plant must be selected. Pumping raw sewage should be avoided whenever possible, especially in a small community. If the topography permits, adequate head or fall should be provided at the proposed treatment site. Deep filters require up to 12 or 15 ft. of head; shallow filters from 8 to 12 ft.; and activated sludge only a few feet.

In the particular location shown on the accompanying map (Fig. 2), the lake on which the community is

located complicates the design of the sewer system. The sewage must be discharged into the lake after treatment at some point where it will cause the least objection. From the standpoint of general layout, it would be best to place the treatment plant south of the village; but this is undesirable because there is a bathing beach and recreation park in that area. The treatment plant must be placed as far as possible from these, and a site between Washington and Dock Streets appears suitable. This is rather close to the built-up portions of the community, but modern methods of sewage treatment permit

the construction of plants which are pleasing in appearance as well as unobjectionable. As already stated, pumping should be avoided whenever possible in the small plant; for this reason and because a properly designed plant will not create nuisance, the rather close-in location is selected.

Fig. 2 also shows part of the preliminary general plan of the sewer system. The contours on this sheet are drawn at 10-ft. intervals. The designer must have a good mental picture of the lay of the land and must be able to visualize how the sewers must run in order to reach the outfall without excessive depth. Often several layouts must be tried before the best one is found. The object is to provide a system that will serve all parts of the community and will cost the least to build, consistent with good construction.

General Design Data

After the sewers have been laid out, the next step is to indicate by half-arrows how surface water will move along the streets. This is shown in Fig. 2; also the next step, which consists in marking off with dotted lines the area contributing to each manhole, and indicating in each the area in acres. These areas, which are used in determining infiltration contributions, may be measured by any convenient method. Manholes are numbered, also in any convenient manner; frequently they are numbered consecutively from the outlet of the main sewer, but this method is not used in this example. Branch lines may be designated by A, B,

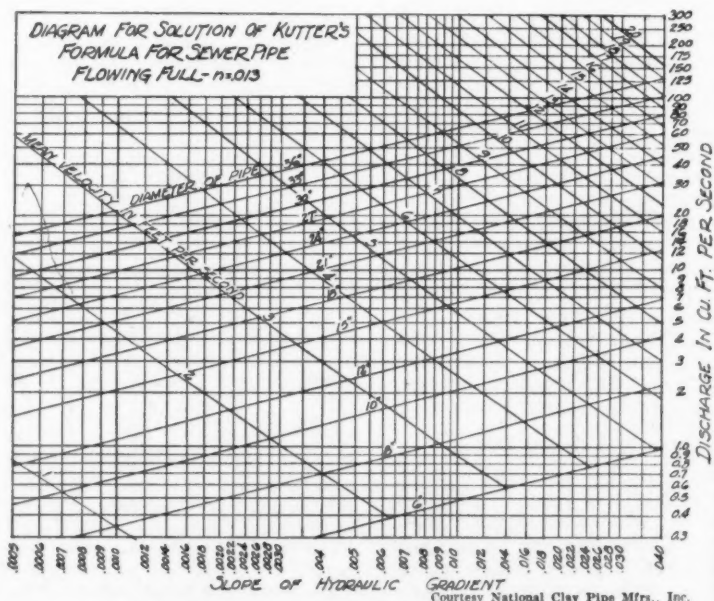


Fig. 5. Diagram for the solution of Kutter's formula.

Inc.

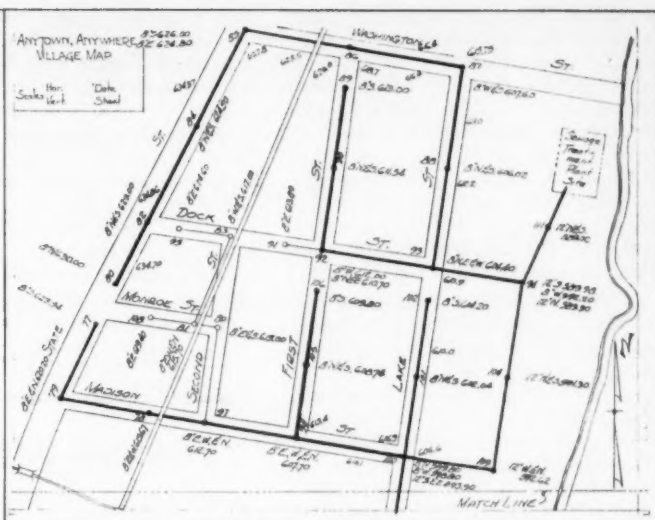


Fig. 6. Master plan of the system.

Fig. 3 shows how the preliminary profiles appear. These profiles are used to determine whether or not the grades available are adequate. For this preliminary work, only the line representing the invert need be shown. The deeper cellars should be shown, especially those that may be factors in determining the depth of the sewers. In the usual case, allowance should be made for house sewer grades, usually about 20 ins. per 100 ft., plus the loss due to the depth of pipes below the cellar floor, the bends, etc., all of which should be totaled to determine the required depth of the sewer line. In Fig. 3, elevations of the inverts are given at the manholes and are shown at the bottom of the drawing. Elevations are shown for all lines coming into each manhole. This is necessary because sometimes the branch line will determine the elevation of the main line invert.

Manholes may be of brick or of concrete. They should have an internal diameter of at least 4 ft. to permit use of standard sewer cleaning equipment. Branch sewers are usually brought into manholes with invert elevations above the invert elevation of the main sewer to prevent backing up of sewage into the branch lines and possible stranding of solids. The invert of the branch

It is assumed that all of the water used goes into the sewers, and that there are no large private supplies. Infiltration into the sewers must be

estimated. This may range, according to local conditions and the quality of the work, from 500 to 1500 or more gallons per acre per day for the area contributing to the sewers. It will be assumed that conditions are average and that infiltration amounts to 1,000 gals. per acre per day. This, with the flow of domestic sewage, as determined above, amounts to 0.0071 cubic feet per second per acre from the sewered area.

Designing begins at the upper end of the uppermost lateral. This line is followed to its intersection with another line; then all of the laterals that terminate at this junction are considered. Computations then proceed to the next junction, and so on through the system. In preparing the computations, a table similar to Fig. 4 may be set up. It may be desirable to add other columns to indicate invert and ground elevations at both upper and lower ends of the sewer under consideration. Such data have been omitted from Fig. 4, in part because it is difficult to present on a page of this size such a long table with the type large enough to be readable. However, the general procedure is shown and additional desired data can be added easily.

Fig. 5 is a diagram for the solution of Kutters formula, for pipes flowing full. The slope is shown at the bottom of the chart. For any given slope, follow the vertical line to its intersection with the pipe size under consideration; then follow the horizontal lines to the right margin to determine the discharge in cu. ft. per second. For example, it is desired to determine the velocity and discharge of a 10-inch sewer with a slope of 0.003. Starting with 0.003 at the bottom of the chart, the vertical line is followed to its intersection with the line marked 10". The diagonal lines indicate the velocity, and this is found to be a little over 2 ft. per second. The discharge is shown by the extension of the horizontal line to the right margin and is found to be 1.12 cu. ft. per second.

The depth of sewage flowing in the pipe influences both the velocity and the discharge, except that when flowing half-full the velocity is the same as when the sewer is full. For other depths of flow, reference should be made to charts for flow in partly-full sewers, which will be found in most text books on sewerage.

Fig. 6 shows a portion of the collection system with a minimum of other detail. A complete map of this type might be called a master plan of the collection system. The heavy lines show the parts of the sewer system included in the initial construc-

tion program; the remainder of the system can be built as needed. Final construction plans must be drawn for the sewers shown in heavy lines. A record of wye locations should be maintained by the engineer and recorded with the Village so that future sewer connections can be readily made.

Fig. 7 illustrates a construction drawing. All water mains and underground structures should be shown; also pavements; and everything else that may influence construction. House connections are shown; how-

ever, these may not be installed precisely where shown, as they should be placed to satisfy the property owner. In any event, an accurate record of their actual position should be maintained and recorded. Wyes should also be provided for vacant lots and an accurate record of their location also maintained.

On each sheet of the plans should be shown the elevation and location of the nearest benchmark, so that information is readily available for setting grades for construction work or for later extensions.

Human Waste Disposal From Trains

FIFTY years ago the American Public Health Ass'n appointed a committee on railroad car sanitation. Since then, from time to time, several states have adopted regulations concerning the disposal of human wastes from railroad passenger cars. All were based on the idea that discharging such wastes onto the roadbed was not only aesthetically objectionable but constituted a health menace. However, the latter assumption is unsupported by epidemiological data. In 1928 the Association of American Railroads appointed a Joint Committee on Railway Sanitation, containing representatives of the medical, mechanical and engineering divisions of the Association, and invited the U. S. Public Health Service to be represented thereon. The last named in 1942 expressed its belief that the ultimate solution of the problem would be the permanent installation of retention tanks on the cars to receive the flushings from the toilet hoppers. The Joint Committee on Railway Sanitation believed that this was open to serious question, but, the war intervening, took no definite action until 1946, when it engaged Abel Wolman as consultant director. He organized the investigation, securing personnel, office and laboratory facilities.

Epidemiology

Dr. Kenneth F. Maxcy, epidemiologist, was retained to review all the pertinent evidence, and he reported that: "It can be stated with reasonable assurance that information at present available fails to establish the existence of a public health menace resulting from the method of disposal of fecal wastes employed by railways. This by no means proves the negative—that such a menace does not exist. It is reasonable to assume, however, that this practice

has in the past been a relatively unimportant route of dissemination of the pathogenic organisms which cause the commonly recognized enteric infections."

Another field of investigation was that of the existing conditions on toilet use in railway cars. Passenger coaches on a Pennsylvania New York-Washington train and a Pittsburgh-Washington train were fitted with automatic devices in both men's and women's toilets which registered the number of times entered, number of flushings of the hopper, and water consumption. The wastes collected in the retention tanks were analyzed and the BOD found to be roughly 9 times that of ordinary domestic sewage. It was calculated that on the average the coaches deposited 0.00235 lb. of solids, dry weight, per mile of track for a single run; and that all the coaches in the country in one year discharged an average of 0.3 oz. per yard of track; but 1.067 lb. on the New York-Washington line, the most heavily traveled in the United States.

Results of Experiments

The above is abstracted from a paper before the American Public Health Ass'n by Abel Wolman and Lloyd K. Clark. The authors also report that: "the Project has experimented on a great many treatment methods and devices. These efforts have been directed toward programs for comminution and disinfection.

"Subdivision of particles was considered desirable not only to simplify the disinfection process, especially if disinfection is to be accomplished by heat, but also to convert feces, paper, and cloth articles into a sufficiently finely divided state to reduce visibility on controlled discharge at high train speeds. Such a device must be rugged because of metal and glass

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objects; it must be small and a low power-consumer. The search is continuing for the ideal grinder, but a commercial unit exhaustively tested in the laboratory has been installed on a hopper on a test car of the Pennsylvania Railroad operating between New York and Washington.

"Extensive research has revealed that disinfection of macerated toilet wastes by heat is well within the realm of practicability. Much experimentation remains to be done on the preferred methods of applying the heat, but the source of heat is apparently sufficient when supplied either by electrical means or by

steam, or by a combination of the two. These means are being employed in a test apparatus mounted on the Pennsylvania car carrying the grinder. Although sufficient data are not available at this time to warrant conclusions, it may be stated that a temperature not exceeding 160° F. and a holding time of not more than a few seconds will produce the desired negative coliform results."

Where the installation of treatment units on each car may not seem to be justified, they are considering development of a simple receptacle to hold all of the flushings until the terminal is reached,

tice this condition is extremely difficult to avoid in a climate like Wake's.

To place clean, nonrusted bars would have entailed extensive sand-blasting with increased time of completion of the job.

There were also inspected: Airplane warm-up area, 6 inches thick, 26,000 square feet; two underground hospitals, 8,675 square feet; one underground dispensary, 640 square feet; one surface shop, 1,024 square feet; five surface utility buildings, 3,194 square feet; Officers Club, 6-inch floor slab, 3,390 square feet; several 90-millimeter gun emplacements, and underground communication structure.

From information available, the above structures were built late in 1941, 1942, and 1943, with the exception of the Officers Club which was built in 1945. Inspection revealed them to be in excellent condition with practically no deterioration of the surfaces, including those exposed to the weather. Very little cracking, crumbling or spalling was apparent but the usual hair-line cracks were observed. In one communication dugout there was a rupture one-half inch in width and 5 feet in length exposing reinforcing steel bars caused from faulty design and not the concrete. Reinforcing steel was exposed by drilling into the walls. The steel showed a small amount of rusting, but the concrete was not stained. The water cement ratio and method of curing are not known.

Yearly average temperature, 80°; daily variation of temperature, 8 to 10°; yearly rainfall, 17 to 20 inches; and relative humidity, 78 percent.

A study of the foregoing comments indicates that: (a) That brackish water of low-degree salinity (57 grains NaCl per gallon as compared to 1,638 grains of ordinary sea water) has no apparent adverse effect on the concrete compressive strength when employed in the mix; (b) that the amount of brackish water used in concrete mixes at Midway, Johnston, and Wake probably had its saline properties considerably reduced by the large moisture content of the aggregate; (c) that use of brackish water does not result in any appreciable increase in corrosion of reinforcing steel; (d) that cracking and spalling is not a direct result of the use of brackish water; (e) that curing concrete, fabricated with brackish mixing water, at an average relative humidity of 75 to 80 percent and at an average temperature of 80° F. apparently is no guarantee that cracking or spalling will be prevented.

Salt Water Concrete

THE following is a synopsis of reports received from advance bases in the Pacific, covering the results of using salty or brackish water for mixing concrete. These data were published in the Civil Engineer Corps Bulletin of the U.S. Navy.

Naval Air Station, Midway Island.—Brackish well water which was used for all concrete work on Midway Island during the war had an average salinity of 57 grains per gallon.

An inspection of existing concrete structures showed the following: (a) The present condition of all concrete is good; (b) there is no sign of deterioration of the surface; (c) there is no serious examples of cracking, crumbling, spalling of concrete, or exposure of reinforcing steel; (d) the reinforcing steel exposed by digging into concrete was found to be in good condition with no signs of rusting; (e) a search of the files has uncovered no information as to the dates the concrete was placed, or the characteristics of the mixes used, but it is believed that all construction was performed during 1941 to 1944.

The largest concrete job was the underground Diesel and fuel oil system which consisted of four 13,500-barrel steel tanks and four 27,000-barrel tanks and required 4,700 cubic yards of reinforcing concrete.

Water was obtained from a brackish well, but usually no water was needed because the aggregate contained so much. Concrete strength was held to 3,000 pounds at 21 days; 7 sacks were required, on less important work a 6-sack ratio was used.

Naval Air Station, Wake Island.—No extensive concrete construction was employed on Wake. However,

two basketball courts and a few concrete quonset decks were built, using brackish water. These items have been inspected and conditions noted as follows: (a) Present condition of concrete is poor; (b) surface beginning to deteriorate; (c) number of large cracks and spalling evidenced; (d) steel reinforcing exposed by digging found to be slightly rusted; (e) no information as to date placed or characteristics of mix; (f) curing conditions: average temperature 78° F., average rainfall per month 3.32 inches, relative humidity 78 percent.

Naval Operating Base, Saipan.—Unable to determine if any such concrete was ever placed on Saipan.

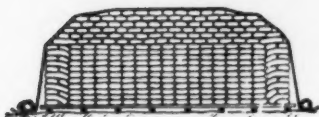
Naval Air Station, Johnston Island.—Existing concrete structures on Johnston Island and Sand Island are as follows: Recreation halls: (a) Present condition of concrete is poor; (b) surface is deteriorating; (c) concrete crumbling in spots and is very powdery when chipped; (d) reinforcing steel slightly rusted; (e) no information as to date placed or characteristics of mix; (f) same as above. Concrete still around base of Quonsets for typhoon protection: (a) Condition of concrete is fair; (b) slight signs of deterioration; (c) minor cracks and spalling quite evident; (d) reinforcing steel slightly rusted; (e) no information as to characteristics of mix, date placed June 1946.

Concrete made here with brackish water is not good. It cracks and spalls easily and crumbles very easily under impact. The condition of steel reinforcing does not give an indication of the action of brackish water on steel, as I believe that bars were placed with a coat of rust on them. Though not according to best prac-

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**A condensation of an article in the Traffic Quarterly
of the Eno Foundation for Highway Traffic Control**

PARKING LOT OPERATIONS

WILBUR S. SMITH, Technical Advisor
and CHARLES S. LECRAW, JR., Traffic Engineer

A HYPOTHETICAL parking lot, representative of the average downtown commercial parking facility, is here constructed from a comprehensive study of parking lots recently completed by the Eno Foundation. The hypothetical lot would be in a city in the population group 50,000 to 100,000. It would be located in the central business district, or immediately on the fringe. Its management would be alert; its attendants clean and courteous. It would be managed either by the owner or by a person employed for this purpose. The lot would be licensed by the city, but many of the applicable regulations would not be imposed.

Physical Features

The lot would occupy approximately 25,000 square feet of land area, and would be rectangular in shape. About ten percent of the area would be devoted to automotive services—the sale of gasoline and oil, washing, and lubrication. Whether cars are parked by attendants or by customers makes a difference in capacity; attendant-parking requires 200 square feet per car and customer-parking 243 square feet per car. Thus the lot could park 112 cars by using attendants, but only 92 if customers are allowed to park their own cars. All of the cars would be parked at a 90-degree angle. Attendants back them into stalls; customers head into the stalls.

By backing cars into position, a shorter turning-radius is needed, thereby requiring less aisle space than for heading cars into stalls. Of twenty-four lots studied having attendant parking, twenty employ back-in parking at a 90-degree angle, because it provides the maximum use of lot space.

This average or synthetic lot as it actually appears has a good surface of bituminous material. It has lighting for night operation, but not of high type. In appearance, the lot is drab, with no attempt to landscape or otherwise beautify it. However, the general appearance of the lot is not bad, mainly because it is kept clean. Waiting-room facilities are not available for customers except in connec-

tion with the service station operated by the lot. The space devoted to waiting-rooms is small and crowded with automotive parts and accessories.

Ownership, Lot Age and Traffic

About one-fourth of the lots studied conduct operations on land owned by the operator. These lots have been in operation from one to eighteen years; average for the owned lots is eleven years.

The remaining three-fourths of the lots (in which group the assumed lot would fall) operate on land leased expressly for the purpose. One of these lots has been operating for twenty-six years. The average length of operation for rented lots is twelve years. The rented lots have been in operation slightly longer than those owned by the operators.

A lot is *not* able to measure the parking demand directly from traffic volumes. The study indicates no fixed relation between traffic volumes on a street and the number of cars entering a lot. Parking demands can be more accurately related to *land-use* characteristics. A much larger turnover of cars is obtained by a lot situated in a retail shopping center than by a similar lot in an area of office or industrial buildings, but exposed to the same traffic volumes.

The greatest period of parking activity is from 7 A.M. to 9 A.M., but can vary with the working habits of the community. The greatest single hour of activity is from noon to 1 P.M. A steady demand is created by shoppers during the early afternoon hours. The demand decreases in the late afternoon, but increases again in the early evening. Saturday is the peak day of parking demand; and Friday follows closely. The least demand for parking is in the middle of the week.

About a fourth of the lot's customers park for one hour or less; another 25% park from one to two hours; and an equal number from two to three hours. This means that 75% of the customers desire to park three hours or less. A turnover of between two and three cars per space might be expected during a normal working day.

The efficiency of space-use is normally expressed as a percentage ratio of the space-hours *available* to the actual space-hours of *occupancy*. The figure for space hours available is obtained by multiplying the total hours of lot operation by the number of parking stalls. In the case of the hypothetical lot accommodating ninety-two cars, 920 space-hours are available during a ten-hour day. A simple measure of the percentage efficiency of the lot is determined by dividing the total space-hours available into the space hours used. In the case of the composite lot, the average space-use of 50% prevails. This means that the lot would operate at 50% of its capacity during the average ten-hour day. The space-hour efficiency will vary for each period of the day, about as follows: *Table 1*—Less than 25%, 0.7 hr.; 25% to 50%, 4.3 hrs.; 50% to 75%, 3.7 hrs.; 75% to 100%, 1.3 hrs.

Operating Characteristics

The land area of a lot can be divided into three general classifications: 1. *Storage Area*—land used for the dead storage of vehicles. 2. *Aisle Area*—land used for access to storage area and for maneuver into and out of the parking stalls (includes area used as reservoir for incoming cars). 3. *Waste Area*—land used for neither storage nor aisles and rendered useless because of the dimensional layout of the lot or because of inefficient parking arrangements.

Some lots utilize 100 per cent of their area for dead storage. This means that cars must be moved in order to deliver cars parked in the rear sections of the lot, developing two serious disadvantages:

1. The customer is required to wait unduly for delivery. Waits up to 10 minutes were observed for a lot operating in this manner.

2. Cars moved from forward stalls must be stored temporarily on the streets or sidewalks adjacent to the lot, thus congesting vehicular and pedestrian movements.

Some lots use only 47% of their area for vehicle storage. The synthetic lot uses 62% of its area for dead storage; 36% for aisles, and the remaining 2% is waste area.

One of the factors in the operation of an attendant parking lot of concern to the patron is the delay between the time he delivers his ticket stub and the time his car is received. Peak-hour waiting times were found to vary from ten minutes to as low as one-half minute. Off-peak waiting times varied nearly as much: from

(Continued on page 50)

Effects of Low Temperatures on Trickling Filter Operation

EARL H. ARNOLD

Senior Sanitary Engineer, North Dakota Department of Health

(In the North Dakota Official Bulletin)

A LITTLE information is available on the relative efficiencies of sewage treatment plants, in terms of BOD removals, during summer and winter conditions. In some of the northern states, the problem is two-fold in its implications. One phase is associated with the disposal of sewage treatment plant effluents into ice-covered streams; the other is economic and is concerned with the behavior of plant processes which are housed for the protection of the unit during the winter.

The cost of such housing is not inconsiderable, and frequently represents a relatively large proportion of the plant cost, particularly in the case of trickling filter units. In addition to the capital cost of the housing, maintenance may represent a sub-

stantial portion of the annual labor cost, particularly where metal is used in the superstructure. However, in portions of the midwest, it has become almost standard practice to provide cover for all of the plant units to give what is considered necessary protection during the winter season.

North Dakota Studies

Some data have been collected on the relative efficiencies, in terms of 5-day BOD removal, of two low rate trickling filters at Grafton, North Dakota. This treatment plant provides screening, grit removal, primary sedimentation, and intermittent low rate filtration. The digester is, of course, covered and heated, and one of the two filter units is housed. The grit chamber, clarifier, and the

second filter are unprotected. Normal practice at the plant had been to shut down the open filter at the onset of cold weather, and to put it into operation in the spring, the housed unit carrying the entire load during the winter months.

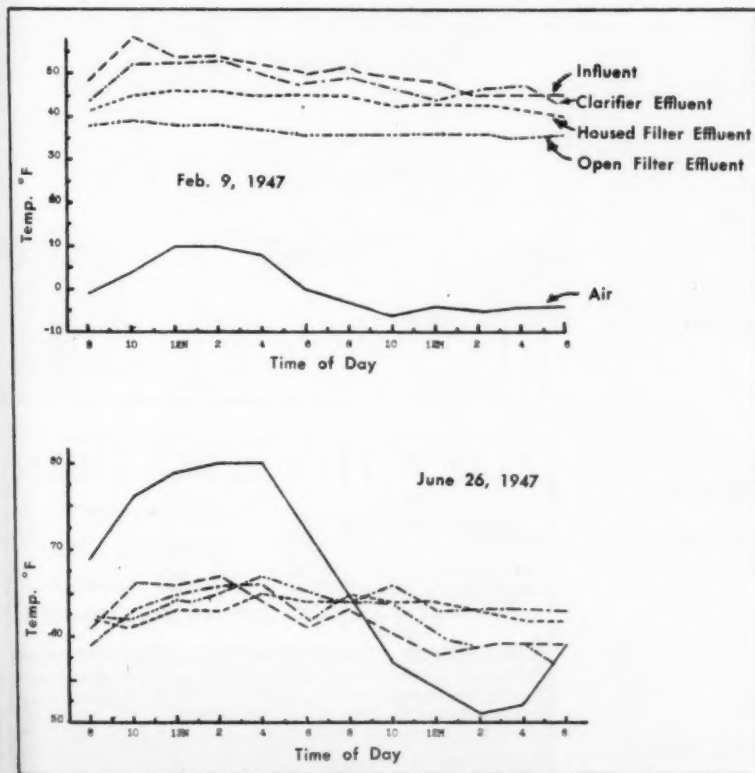
The two filter units are identical in design and construction. The filter media is broken granite, 2 to 4 inches in size. The underdrainage system is of slotted 6-inch tile spaced on 12-inch centers. Sewage is fed to the filters through 45 fixed nozzles. The filter walls extend approximately 6 inches above the ground surface. The filter wall acts as a foundation for the housing. The population of the city is 5,160, but information is not available as to the proportion served by the plant. The sewage is largely domestic, with but minor amounts of laundry and creamery wastes being treated.

The samples were collected and examinations performed when time permitted and were not so frequent or complete as desired. The samples used for BOD and chemical determinations were composited over a 24-hour period, the temperature of the sewage being taken at the time of collection of the individual samples, and weighted as were the samples, in proportion to flow, in order to arrive at the mean temperatures.

Samples and Analyses

Samples were collected at four points in the plant; (1) the plant influent; (2) clarifier effluent (to dosing tank); (3) the open filter effluent; and (4) the housed filter effluent. The analysis of the samples included, in addition to the BOD, determinations of ammonia, nitrites, nitrates, and total nitrogen.

One set of samples was taken on Feb. 9, 1947, during a very cold period. The temperatures were as follows: (1) Plant influent, 49.8; (2) clarifier effluent, 48.2; (3) open filter effluent, 36.6; and (4) housed filter effluent, 43.6. Air temperature varied from about 5 below zero to 10 above. Corresponding samples taken on June 26, 1947, had temperatures of



February and June air and sewage temperatures.

TABLE I—FEBRUARY SAMPLES

Point	NH ₃	NO ₂	NO ₃	Total N	BOD
1	15.4	0.008	2.16	28.7	182
2	12.0	0.008	6.00	30.1	123
3	6.6	0.74	2.12	21.0	58
4	10.4	1.37	2.00	20.6	48

TABLE II—JUNE SAMPLES

Point	NH ₃	NO ₂	NO ₃	Total N	BOD
1	19.0	0.017	2.52	27.9	163
2	17.0	0.017	2.80	24.8	73
3	3.5	1.05	3.68	5.8	57
4	4.0	1.13	3.20	8.7	45

65.0, 65.6, 67.1 and 66.5, with an air temperature of 80 at midday and around 50 at night.

Analyses showed the results indicated in Tables I and II.

(In the original article, data were included for Nov. 15, 1946; Jan. 10, 1947; April 10, 1947, in part; and Sept. 27, 1947. In the Nov., April and September analyses, BOD reduction was better in the open filter. "Chemical data were not particularly conclusive.")

It is possible that actual differences in reaction rates may exist in the separate units, or that gas exchange above the filter or via the underdrainage system may differ

greatly. In addition, distribution of the sewage on the filter media may be influenced by accumulations of ice. All of these may be contributing factors, and it also may be that the importance of any one as a controlling reaction may vary with the season, or the degree of protection provided.

However, the criteria of comparison is that of removal of ultimate BOD. While the information available is on the basis of the 5-day 20°C. BOD, which may or may not represent fixed portions of the ultimate BOD, the data suggests that while temperature does affect filter efficiency, this effect is not marked.

In general, the efficiency of the open filter, as measured by the 5-day BOD removal was but little lower than that of the housed filter, even under relatively severe winter conditions, and the open filter appears to be more effective during warm weather.

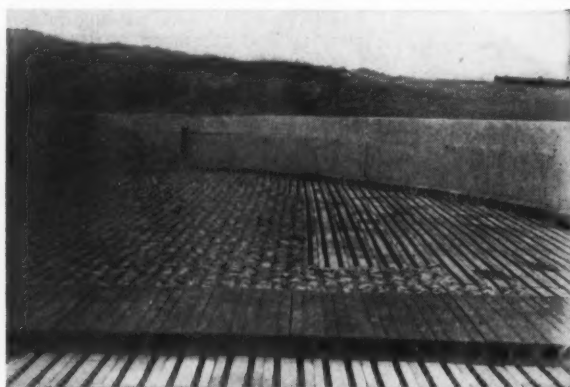
Parking Lot Operation

(Continued from page 48)

four minutes to one-half minute. The hypothetical lot has a peak-hour waiting time of three minutes, an off-peak time of one minute.

Land Values

The assessment of land for the hypothetical lot would be \$3.17 a square foot. The highest assessment found was \$11.50 a square foot. This is the same value used by tax assessors when the lot was first used for parking eight years earlier. Another lot, converted to parking in 1930, reported an assessment of \$47.16 a square foot at the time of conversion, whereas now it is only \$6 a square foot. The lowest assessment recorded, 14 cents a square foot, compared to 12 cents a square foot when the lot was first used for parking fourteen years ago.



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(NAMES OF USERS ON REQUEST)

Where possible, information on assessments was broken down to show values of land as apart from those of improvements. Owned lots report more improvements than do rented lots. The average rented lot reports only 1.9% of its total assessment as charged to improvements, compared to 6.2% for the average owned lot. The ownership of land, therefore, seems to encourage greater development and improvement of the facility, thereby providing more comfortable, complete and efficient service for patrons and employees.

Operating Expenses

The operating expenses of parking lots can usually be broken down as follows: (1) Charge for land use. (2) Salaries—parking attendants, service attendants, clerical workers and management personnel. (3) Insurance. (4) Taxes. (5) Maintenance. (6) Utilities and other expenses. The composite lot would pay an annual rental of 43 cents a square foot. The annual rentals vary from \$1,250 to \$31,200. The annual square-foot rental varies from 8 cents to one dollar.

The largest single expense is that of salaries, though this item varies from 25 to 79% of the total operat-

ing expenses. The hypothetical lot would show salaries as 55% of its total expenses. Very little difference was noted between the salaries of employees in lots with customer-parking and those having attendant-parking.

Considering salary costs in terms of cars parked, the figures range from 1.1 cents to 18 cents a car. The average cost of salaries for the hypothetical lot is 7.1 cents a car parked. Four types of insurance are normally carried by parking lots: public liability, employee liability or compensation, fire and theft of cars, and loss of contents of cars. Insurance costs range from nothing to \$2500 a year. The cost of insurance for the hypothetical lot is 0.14 cent a car.

Property Taxes and Maintenance

The tax rate for the "average" lot is 36 mills for each dollar of assessment. Tax rates for each \$100 of assessed valuation of land varies from \$1.40 to \$6.89. These rates include both city and county taxes. The average for owned lots was 41 mills and for rented lots, 35 mills. The annual property taxes varied from \$115 to \$15,000. When reduced to unit values in terms of cars parked, these taxes range from 1 cent to 8 cents for each

car. Taxes for the hypothetical lot are 2.4% of the total operating expenses.

A wide variety of operating costs are charged to *maintenance*: resurfacing, stall marking, snow removal, and general repairs. Annual maintenance costs range from \$25 to \$3200. Our hypothetical lot would have an annual maintenance cost of 3.6% of its total expenses.

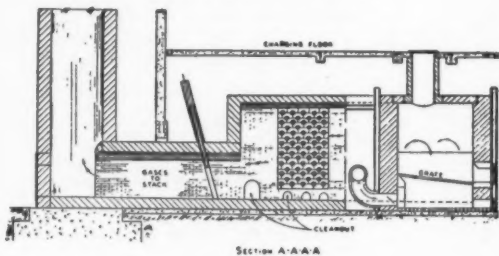
Utilities and Other Expenses

In addition to miscellaneous expenses, these expenses include the costs of electricity, utilities, and miscellaneous license fees. Electrical services are directly affected by the size of the lot, hours of night operation, and the geographical location of the lot. License costs, in relation to other operating costs, are small. In most lots, they range from \$10 to \$25 a year. Highest licenses reported were about \$100 a year.

In terms of patrons other expenses range from 0.08 cents to 6.5 cents for each car.

The foregoing sections have discussed various expense items which may be expected in connection with the operation of parking lots. Table 2 shows the typical expenses of our synthetic lot.

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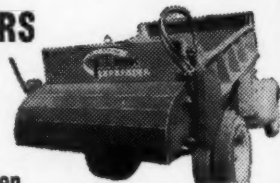
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Table 2.—Typical Expense Breakdown

Expense Item	Percent of Total Cost
Charge for land use.....	33.9%
Salaries	54.7
Insurance	1.0
Taxes	2.4
Maintenance	3.6
Utilities and other expenses	4.4
	100.0%

Parking Lot Income

The lowest gross income in terms of cars parked was nine cents a car. The parking rates are reasonable at this lot: five cents for the first two hours, and five cents for each additional hour. The largest average income per car parked was 93 cents, at a lot handling about 140,000 cars a year. It is interesting to note that this lot is almost identical in size to the lot reporting an income of nine cents per car. The difference in income is obviously in the rate structure; the lot with high income charges 25 cents for the first hour of parking and 10 cents for each additional hour. The gross income for our hypothetical lot is 32 cents per car.

The calculated net income per car space varied from \$2 a year to \$209 per year. The net income of the composite lot would be approximately \$53 per car space per year, and the net income per car would average 7.9 cents.

Disposal of Pharmaceutical Wastes

The plant of Lederle Laboratories, located in Pearl River, New York, covers 350 acres of which 150 acres comprise the operational area. There are 150 buildings in which 2,500 people are employed. The water consumption, electric power required, and the sewage flow produced by the plant give it a domestic equivalent of a city of 25,000. The laboratory is located on a water shed that supplies drinking water for almost the whole of northern New Jersey, a factor which demands the positive destruction of all putrescible or contaminated matter.

Up until 1945 waste collection was done by horse and tractor-drawn wagons and disposal was accomplished by open pit burning and burying. This method required 80 to 100 man-hours per day and the almost constant use of a bulldozer to dig and cover pits.

The solid waste material consists of combustible rubbish, garbage, manures, and certain valueless by-

products from the plant operations. The bulk of the load is made up of general factory rubbish, such as crates, boxes, and waste paper. Many of the raw materials used in the production processes are delivered in wooden boxes and crates, or are paper wrapped; and a proportion of animal or vegetable matter often adheres to the containers after they have been emptied. Garbage represents a relatively small proportion of the whole, and consists primarily of the residue from the company's cafeteria. At times as many as a quarter of a million animals from

mice to horses are housed at the plant, and the contaminated manures produced by these constitute a substantial part of the load. Valueless by-products from the plant operations include a variety of waste powders and semi-liquids, such as mycelium, diatomaceous earth and solvents, together with a considerable weight of broken glass.

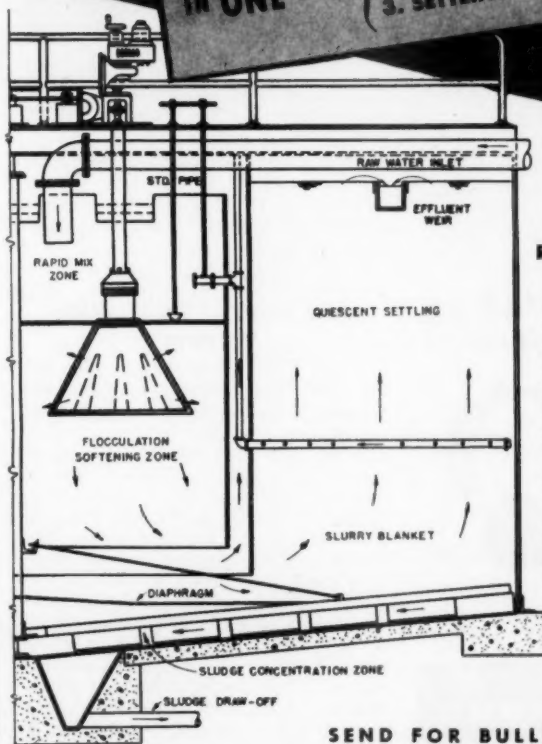
Average daily quantities of these waste materials are: 10 tons of combustible rubbish; 2 tons of manure; between 3,000 and 4,000 pounds of air dried sewage sludge; 5 tons of waste powders; about 2 tons of

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Fisher Research Laboratory, Inc.
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broken glass; and 4 or 5 barrels of contaminated solvents. This amounts to 20 or 30 tons of total waste materials each day in a 15-hour shift.

Early in 1945, a new type of incinerator was installed by Nichols Engineering & Research Corporation, 60 Wall Tower, New York City. This type of plant is known as the Nichols Duoearth Drier incinerator. The plant is operated by a crew of seven men, spread over a 15-hour day. Four of these men are collectors, who pick up 62 Dempster Dumpster boxes scattered throughout the plant, using Ford trucks equipped with Dempster Dumpster hoisting units. The rubbish boxes vary in size from two to six cubic yards and are adapted to the type of material collected at the various points in the plant. The longest haul is one mile, and some of these boxes must be dumped as many as four times a day, others only twice a week.

The collection of material is done in such a manner that the best possible balance of wet and dry material is maintained. Since the incinerator was started in April, 1946, less than 2,000 gallons of fuel oil has been used to help burn the rubbish. All materials are dumped on the charging floor and examined by the operator. This is done to separate iron, pipe covering, and other materials that do not need to be incinerated.

These data are from a paper by C. H. P. Arbogast, General Supervisor, Lederle Laboratories, before the Fourth Industrial Waste Conference at Purdue University.

APF Says: "Do It With Mirrors"

Probably most sewerage engineers receive "Sewage Works Journal," and perhaps they noticed on page 925 of the September issue a brief item telling how to light the interior of a sewer by sunlight reflected from a mirror above ground, through a manhole to another mirror at the bottom which in turn reflected it into the sewer. The writer used this method 60 years ago. It worked fine, but it was a bit awkward to lower my head into the manhole invert so I could look into an 8" sewer (without getting my hair in the sewage) and at the same time hold the mirror at just the right angle. I solved this by cutting a 6" round mirror in two and setting the two halves in a frame with their junction horizontal, the frame being jointed at the line of said junction so that the two half mirrors could be adjusted separately, the bottom half to reflect the light into the sewer, while the top half reflected a view of the sewer's interior to my eyes while I knelt in a comparatively comfortable position.



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SAVING WITH ELECTRICITY

O. J. STEWART

General Manager, Water Dept., Greencastle, Indiana

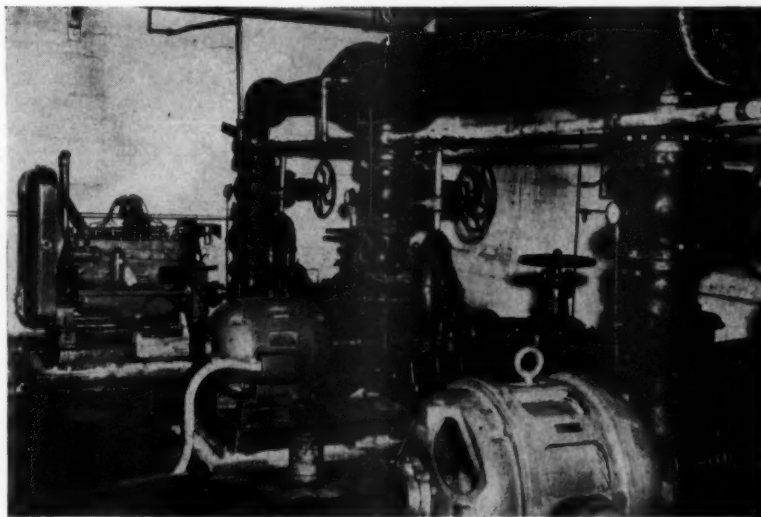
THE public water system of the City of Greencastle has been in existence some eighty-odd years with, until recently, very few major repairs or new installations, either to the pumping station proper or to the water supply. The original installation consisted of two steam-driven, high-lift pumps, a Deane of Holyoke, rated at 1,250,000 gallons per 24 hours, and an Epping Carpenter, rated at 2,000,000 gallons per 24 hours. These pumps, in their last few years of operation, could not have been rated at over 2,000,000 gallons per 24 hours together. The boiler room was equipped with two Heine boilers which were installed in 1906. They had long since ceased to be trustworthy, not particularly due to their condition, but to age. Our insurance company had threatened to cancel the boiler insurance.

The Source of Supply

The water supply during this period was obtained through a series of infiltration tile placed some eight feet below the channel of Big Walnut Creek. This was the only source of supply for this city of 5000 inhabitants, and since it had been in use for the same number of years as the pumps, it also was growing inadequate to furnish the increased demand by our rapidly growing city.

The City purchased this property from private ownership in June, 1935, for \$495,000, to be paid for solely by revenue bonds. These bonds were non-taxable, non-callable, and spread over a period of 37 years. Income was divided as follows: 50% to Bond and Interest Redemption Fund, 5% to Depreciation Fund, and 45% to Operation.

After the control was taken over by the City, a Board of three Directors was appointed by the Mayor and City Council for operation. At the first meeting of this Water Works Board, it was voted to retain all the personnel, including the writer, who had served some ten years under the private ownership. Also at this first meeting, the writer sold the Water Works Board on the idea of in-



Here is a capacity of 1600 gpm. under push-button control.

creasing the source of the water supply at once. Four wells were drilled on City property and were operated by air (there being no electric service available). These four wells increased our supply by some 250 gpm.

Soon after the wells were drilled the Government initiated Rural Electrification. It seemed advisable to electrify completely the pumping station, as this would be much cheaper than to buy new steam pumps and boilers. Plans were drawn for a complete electric pumping station, to cost an approximate \$19,500, which was less than the cost of one new steam pump; but the city officials vetoed these plans for the reason that they had purchased the water plant only one year before.

Troubles Come

With the coming of G. I. trainees to DePauw University at the beginning of the war, our population increased very rapidly, and the infiltration lines and four wells would not produce the water that was needed. So two more wells were driven, and luck was with us. These two wells produced in a six-hour test 2700 gpm. Now it seemed that our water

troubles were over; but with the extra supply of water, the station could not pump enough for the ever-increasing demand.

After ten years of operating with two repair men, and repair parts running into hundreds of dollars, it was very evident that something had to be done. Plans and specifications were again drawn for complete electrification, this time under a new Water Works Board, and a new Mayor and Council. Now it could not fail, for everyone could see the necessity for the change to be made as quickly as possible.

Improvements Begun

In the few years, between the first plans and the second, prices had practically doubled and materials were very hard to find. However, orders were placed for three centrifugal pumps, a panel board and wiring to complete the job. About a year later the material began to come in. Bids were asked for installation but due to our location and the labor situation at that time no one was interested. The only procedure left was to do it ourselves. The work was started at once, with the removal of the old

Deane Pump, while the Epping Carpenter was laboring to supply the city. Fortunately there were no bad fires and three months later the new centrifugal pumps were in operation, with a rated capacity of around 2,200,000 gallons per 24 hours.

Now, almost a year after the start, our pumping station shows very little indication of ever having been steam operated. The only remaining sign is the smoke stack, which is still standing. This we hope to have removed within the next year for safety purposes.

Costs and Savings

The total cost of construction, including the wells, was \$31,690.78, or about twice as much as originally planned in 1935; but at last we have a pumping station capable of pumping all the water that this City may demand in the next few years; also we have enough water available to last for the same period.

During the last month of operation under steam power our coal bill alone was \$1,407.25, and our power bill for the first month was \$604.03. This constitutes a saving in power alone, excluding packing, labor, repairs, etc., of \$803.22.

During construction we also installed a panel board as our control

center. Each of our nine wells was placed by number on this panel so that the operator could start or stop any of the wells or high-lift pumps by pushing a button. There was also installed a Builders-Providence master meter and a new chlorinator, making our chlorination safe, with dual control. This insures the people of Greencastle a safe drinking water for years to come.

Our only major difficulty at present is that the Bond Fund is accumulat-

ing by leaps and bounds. We have enough money to retire six years of principal, interest included. The Depreciation Fund of 5% has been used for construction purposes. With the cost of materials almost tripled, and salaries and wages increased, the plant cannot operate on 45%, nor can we use any of the \$150,000 in the Bond Fund.

So with all our savings from electricity over steam, we are still in the red. What next?

Water Supplies in Illinois

There are 710 public water supplies in Illinois, which are derived from 598 sources. Of these sources, 483 are ground supplies (233 rock wells, 230 drift wells); 113 are surface supplies; and 2 are combined reservoir and well supplies. Lake Michigan provides the source for 11 of the surface supplies; 42 are from streams, and 60 from reservoirs.

Municipally owned supplies number 663, as compared to 47 that are privately owned. The total daily pumpage is 1,177,943,000 gallons of which Chicago and its connected suburbs account for 952,500,000 gallons. Daily per capita consumption of 186 gals. is greatly affected by

the high rate of usage in the Chicago area, with 232 gals. per person per day as compared to 88 gals. elsewhere. More than six million people, or 80% of the state's population, are served by public water supplies.

Highest total mineral content is at Ipava, which enjoys 2,978 ppm., while the lowest is at Coulterville—77 ppm. Greenview has the hardest water—984 ppm.—and Prairie du Rocher the most iron—70.1 ppm.

Treatment is provided as follows: Purification and chlorination, 97 communities; purification, softening and chlorination, 15; softening, iron removal and chlorination, 29; softening and iron removal, 41; softening and chlorination, 2; softening only, 5; iron removal and chlorination, 11; iron removal only, 35; and chlorination only, 93.

The oldest supply is that of Chicago, which dates back to 1843, followed by Springfield and Peoria in 1868. These and much other data are contained in a booklet issued by the Division of Sanitary Engineering, Illinois Department of Health, C. W. Klassen, Chief Sanitary engineer.

Magnetic Highway Sweepers Used by Eight States

Eight states now use magnetic sweepers regularly to keep down flat tire incidence. These are: Arkansas, Kansas, Minnesota, Mississippi, Missouri, Nebraska, North Dakota and Oklahoma. The sweepers are trucks equipped with electromagnets. An average of six pounds of tire-damaging metal per mile per year is reported collected, at an average cost of about \$2.20 a mile.

Perfumed Garbage Cans

At Leigh, England, whose population is about 45,000, the garbage is collected by carrying the individual cans to the disposal works in a Ford truck carrying 50 cans. Here the cans are emptied and scrubbed internally and externally and "each lid is smeared with Fraigrex Jelly which creates a pleasant aroma."



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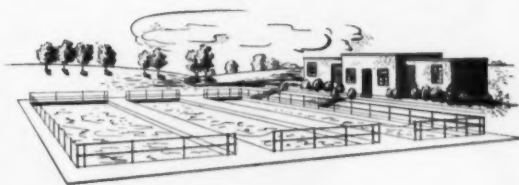
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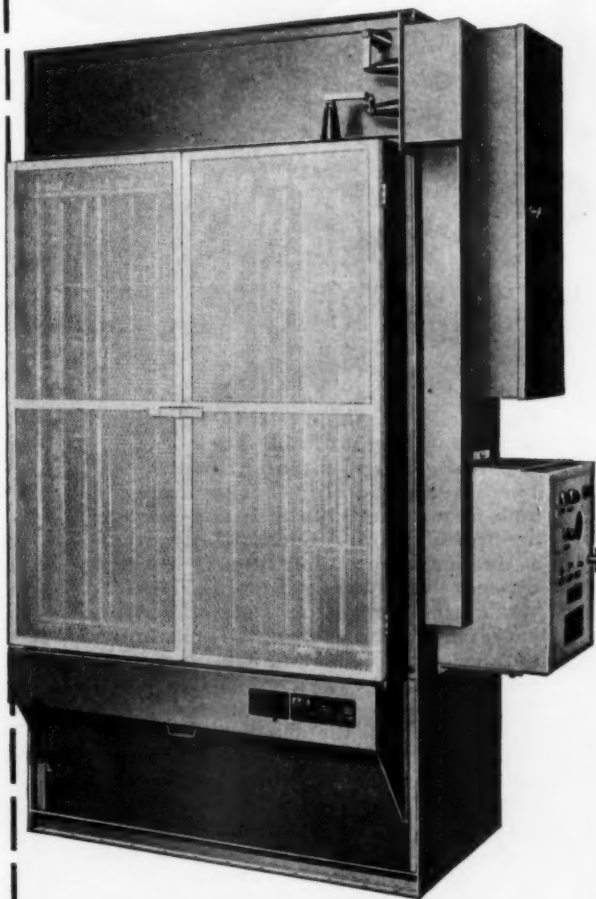
Super-clean air, as supplied by AAF Electro-Matic Electronic Filters, has solved this operating problem for many plants. This modern self-cleaning electronic precipitator offers highest cleaning efficiency over a wide range of particle sizes, from smoke to largest air-borne material. Self-cleaning collector plates permit continuous high efficiency operation and eliminate shutdowns for manual maintenance. Electro-Matic Filters are built in standardized, self-contained sections, are easy to install and have all exposed parts electrically grounded for absolute safety.

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Pre-stressed Concrete Highway Bridge

Nunn's Bridge with a span of 74 ft. and depth of 50 in., is the first pre-stressed concrete cast-in-situ highway bridge to be built in England.

The main factors to be considered in design were to provide a single-span bridge capable of carrying modern loads, to strengthen the end abutments, and to keep constructional depth within reasonable limits.

It was decided to use pre-stressed concrete, as it was felt that it provided the best solution to these problems and would, in addition, reduce weight and keep the tonnage of steel as low as possible.

Following the removal of the old arch superstructure built 140 years ago and the provision of new bearings supported on piles, steel joists, trussed to increase their stiffness, were temporarily supported on the old piers and a timber deck laid across them. The five main beams were cast on this deck. Each beam contained twelve cables, which were prevented from coming into actual contact with the concrete by means of sheaths. Each cable was of about 1-in. diameter, and consisted of twelve high-tensile steel wires over a bobbins wire core. When the specially high grade of concrete which was used in the beams, cross beams and deck had reached the specified strength of 6,000 lb. per sq. in., a tension of nearly 70 tons per sq. in. was applied to the cable by means of hydraulic jacks. By this means, what might be termed a reverse loading was introduced. The cables were later grouted under pressure.

An initial compression of nearly 2,000 lb. per sq. in. was thus induced in the bottom flange of the beams with a compression of just over 100 lb. per sq. in. in the deck. This meant that the application of the Ministry of Transport live loading to the bridge would just be sufficient to overcome the compression stresses in the bottom flanges. *Highway Research abstracts.*

Chicago Orchard Airport

The present Chicago Orchard Airport is located 18 miles northwest of the center of Chicago and consists of approximately 1,080 acres acquired from the United States government without cost to the City. It contains four excellent runways, taxi-ways and some hangar buildings, together with a number of barrack-type buildings.

The master plan for this airport, developed by the Airport Consultant, provides for enlargement of the airport to an ultimate size of 6,882 acres with ten runways arranged tangentially around a central terminal. Acquisition of the necessary land requires relocation of railroad tracks and involves the building of 8 miles of double track. When finished this field will be eleven times the size of Chicago's Municipal Airport, which is one of the largest in the country. The magnitude and complexity of the task of planning and constructing this terminal might be likened to the establishment of a great modern city within the comparatively short period of five or ten years. Large areas of land must be acquired under the public's right of eminent domain; sewers and water mains sufficient to service a large community must be constructed; runways, taxiways and roads, equivalent in mileage and volume of concrete to the pavements of a great modern metropolis, will be laid. Buildings, new in concept and function, will be erected sufficient to house a huge segment of the activity.

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PUBLIC WORKS DIGESTS

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Highways and Airports

This section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of all principal articles in these publications.

The Highway and Airport Digest

Plant Mix in South Carolina

Prior to 1947, South Carolina laid its retread by the mixed-in-place method. Bids received in 1947 for plant-mixed surfacing were less than for the cold-laid type, and about 300 miles of each were laid that year; and for 1948 a higher percentage of plant mix was planned. The advantages of plant mix, in addition to cost, are said by the state engineers to be: Much less interference to traffic while the retread is being put down, less frequent and shorter delays of operations due to bad weather, and possibility of work over a much longer construction season. Normally, in South Carolina, the road-mixed surfacing is not put down before April or after Oct. 15. In contrast, the hot-laid work can be started in March and continued until December.

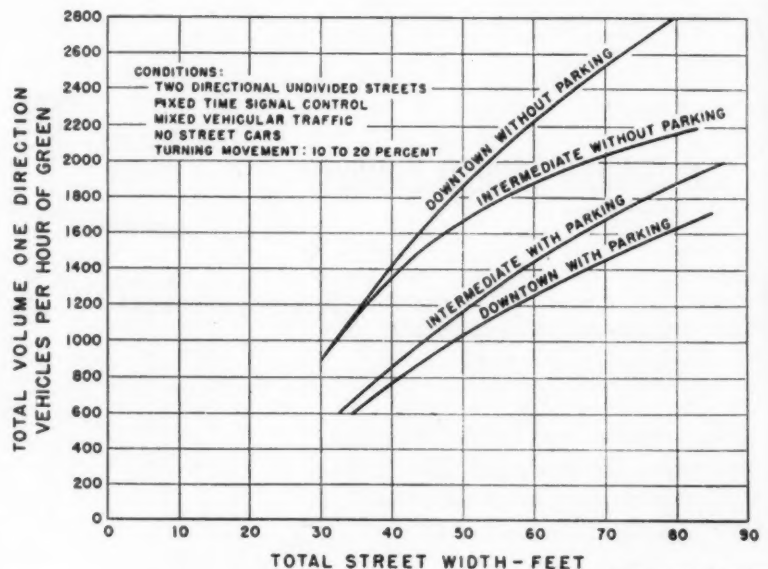
"Plant Mix Cuts Retread Costs on South Carolina Roads"; *Eng. News-Record*, Sept. 2.

Standards of Highway Design

This article was based on a report of the U. S. Public Roads Administration presented at the Chicago meeting of the A.R.B.A. As it occupies over 12 pages of the magazine, only the briefest of outlines is practicable.

The alignment and profile of highways, plan of intersections, clearances and horizontal dimensions of the cross-section are all directly affected by increase of volume and speed of traffic. At present most drivers travel between 45 and 50 mph. The average speed will probably be increased in the future chiefly by reduction in number of low-speed vehicles. A speed of 50 mph is the highest that should be used as a basis in designing local rural roads or urban facilities.

Highway capacity is limited to the number of vehicles that can pass a given



Courtesy Roads & Bridges

Intersecting street capacity relation to street width.

point in a unit of time at reasonable speed. When this number is exceeded, the speed of all traffic is reduced and some improvement is needed. Conditions that cause reduction in capacity include narrow lanes, restricted lateral clearances, narrow shoulders, commercial vehicles, imperfect alignment, and intersections at grade.

For the United States as a whole, traffic on the maximum day is normally 233% and in the maximum hour 25.4% of the annual average daily traffic. It is uneconomical to design the average highway for a greater hourly volume than that which is exceeded during only 30 hours each year, and little will be saved in the construction cost and a great deal lost in expediting the movement of traffic if the highway is de-

signed to accommodate fewer vehicles than the volume exceeded during the 50 highest hours of the year.

"Standards of Highway Design for Modern Traffic Conditions"; *Roads and Bridges*, August.

Designing Cold Asphalt Mixtures

This article describes how to calculate the mixtures for dense graded aggregate, patching and other cold bituminous paving mixtures. It assumes use of a mixer with a capacity of 25 tons per day in 200 lb. batches, operated by 4 laborers, a mixer operator and a spreader raker. The precise amount of asphalt must be determined for each particular combination of aggregates and asphalt, generally by preparing a number of trial

mixtures and testing them by compaction in a cylinder and immersion in water. With some aggregates it is desirable to use additives to overcome the effects of moisture.

For a patching mix of open texture type, for example, the specification suggested is 200 lb. of aggregate and $\frac{3}{4}$ to $1\frac{1}{4}$ gal. of RC-1 or RC-2, or 1 to 2 gal. of emulsion MS-3; all the aggregate being No. 6 for patches over $1\frac{1}{2}$ " deep, and 110 lb. of No. 6 and 90 lb. of No. 8 for patches less than $1\frac{1}{2}$ " deep.

"Designing Cold-Mix Bituminous Pavements"; PUBLIC WORKS, September.

Soil-Dispersing Apparatus For Mechanical Analysis of Soils

A complete mechanical analysis of soils includes the hydrometer analysis of the fine-particle fraction of the sample, suspended in water. The use of the high-speed stirring device specified in A.A.S.H.O. method T88—42 for the preparation of soil-water suspensions for the combined sieve and hydrometer analysis of soils results in degradation of the sand particles. ("Degradation" is defined as the wearing down or breaking of soil particles into smaller sizes). This action is most pronounced in the fraction between the No. 10 (2.0 mm.) and the No. 40 (0.42 mm.) sieves. The hardness of the sand grains is a factor in the amount of degradation that occurs.

Engineers of the Public Roads Ad-

ministration have developed an "air-jet dispersing cup" which greatly reduces the degradation. They report that "The degrading action of the air-jet dispersing cup with dispersing periods up to 20 minutes is no greater than that of the high-speed stirring device with a 1-minute dispersing period."

"The use of the air-jet dispersing cup results in more efficient dispersion of the clay fraction of plastic soil samples than is obtained with the high-speed stirrer."

"The maintenance costs for the air-jet type dispersion cup are considerably less than for the standard stirrer since it contains no moving parts."

"The use of the air-jet dispersing cup in accordance with the tentative procedure contained in this report in which the dispersing time is varied with the plasticity index, will result in mechanical analyses more nearly representative of the actual gradations than those obtained by using the stirring device called for in the A.A.S.H.O. method for mechanical analysis of soils."

A. M. Wintermyer—"A New Soil-Dispersing Apparatus for Mechanical Analysis of Soils"; *Public Roads*, September.

Jet Engine Fuel And Asphalt Pavements

Jet engine planes use kerosene fuels, which soften asphalt pavements. Also the heat of the jet discharge is high. These facts have caused concern to

those interested in airport pavements. The Army Corps of Engineers are studying the problem in the laboratory and brought out some promising products—oil resistant rubbers and several proprietary items.

"Jet Engine Fuel Found Serious Hazard to Asphalt Pavements"; *Eng. News-Record*, Aug. 26.

Jet heat applied to pavements has been reported to be 1500° to 2600° F. But 2 ft. below the outlet of the tail pipe the temperature has cooled to 100°; while sun heat often raises pavement temperature to 140°. The claim that unburnt fuel would be emitted by the jet seems absurd in the light of the fuel economy obtained by the designers of such engines. However, spillage is probable on aprons where maintenance operations are by experimental installations at Air Force bases. The general belief is that a parked plane running its jet engines for 10 or 15 minutes in one spot can soften bituminous pavements and joints between concrete slabs. But more serious is fuel spilled on the pavement. However, it has been found that 1" or more of dense-graded, plant mix, coke oven tar concrete, as a surface course over the asphalt, will prevent such damage; or possibly a heavy double surface treatment of tar binder and fine aggregate. Coke-oven tars are not practicable for joint seals, as they become brittle in cold weather and lose elasticity with age. Tests by the Corps of Engineers have

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carried on. Blasts from jet engines reach 800 fps and present a problem in maintenance of unpaved shoulders of runways and take-off areas, dislodging unbound particles and even turf. This may require use of low-cost cementing binders on such shoulders.

Walter R. Macatee—"Effect of Jet Heat on Airport Pavements"; *Roads and Streets*, August.

Thickness of Airport Runways

The runways of Dorval, near Montreal, Canada, are 14" and have carried over 100,000 operations of aircraft with wheel loads of more than 25,000 lb. By U. S. Corps of Engineers standard they would not be considered safe for loads greater than 5,000 lb.; by U. S. C. A. A. standard the safe load would be 7,500 lb., and by P. R. A. standard, 10,000 lb. Another Canadian airport was used for test flights by bombers with wheel loads of 35,000 lb., but by Corps of Engineers standards they should not be subjected to loads greater than 2,000. Since the spring of 1945 the Canadian Dept. of Transport has been conducting investigations directed by Dr. Norman W. McLeod, to develop a method of runway design in keeping with Canadian experience. At each airport the pavement, base course and subgrade have been subjected to a "plate bearing test," and the subgrade to a cone-bearing test, to a test by

the Housel penetrometer and the California bearing-ratio test. A report has been issued recently giving a design equation and charts of curves from which to determine runway thickness for various aircraft wheel loads; also for highway wheel loads.

Roads and Bridges, August.

Snow Handling in Minneapolis

Minneapolis plows about 1000 miles of streets after each snowstorm and hauls the snow from about 100 miles. A 5" snow is usually plowed in 12 hours and removed in 10 to 14 days, using 97 trucks with one-way plows and 19 large diesel-powered motor patrols. For snow over 14" deep they use a plow 12 ft. long and 42" high mounted on a patrol grader. For loading they use 7 snow loaders, Barber-Greene, Athey and Bros. For short hauls, front-end loaders are used. Each snow loader is served by 10 to 15 trucks, 2 motor patrol graders windrowing the snow for the loaders, and one or two small tractors removing parked automobiles which interfere with the loading. For removing snow from some of the city's hundred bridges, a Snow-Master rotary plow is used, blowing the snow into the river where possible, otherwise loading it into trucks. To minimize the trouble with parked cars, on snow banks which are to be removed signs are placed—"No Parking

10 P.M. to 7 A.M. Snowplowing"; which is not 100% effective, however.

Hugo G. Erickson—"How Minneapolis Does Its Snow Plowing"; *Roads and Streets*, August.

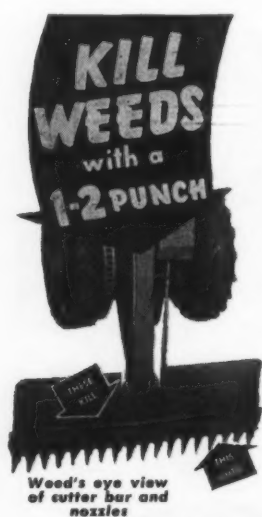
Mixing Aggregate On Farm Land

Material for a 1" leveling blanket on a 14-mile section of a California highway was to consist of asphalt and an aggregate, the specifications for which could be met by mixing filler from a roadside with beach sand, a source of which also was found nearby; the mixture being 10% filler and 90% sand. The oversize material in the fine aggregate was removed by means of a screen consisting of heavy wire fencing on a frame under which trucks could pass. The materials were mixed on a piece of pasture land sloping gently from the highway to the beach. The sand was deposited in measured windrows and these covered with fine material spread from the tail of trucks which straddled the windrows. Oil was then applied and the whole mixed by motor graders.

Roads and Streets, August.

Designing Urban Arterial Routes

Growing traffic congestion in cities is causing many municipalities to give



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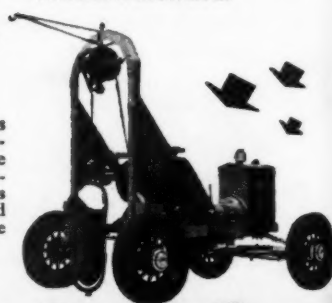
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serious consideration to the construction of arterial routes of one type or another. The design of such a route cannot be developed by a cut and dried procedure set up as a series of standards or instructions. An urban arterial may range widely in form, and details to fit particular conditions can be so varied that each project must be given separate consideration in design. The individuals and groups concerned with urban arterials are numerous, and their approval is essential for obtaining funds and right-of-way, and for receiving the cooperation of the many public and quasi-public agencies whose physical plants will be affected by the construction. Authority and responsibility for all the factors and details of location and design should be vested in an official who will be able to devote full time to it.

Joseph Barnett—"Design of Arterial Routes in Urban Areas"; *Roads and Bridges*, August.

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J. Y. Welborn, Assoc. H'way Engr., Pub. Roads Administration. Sept., Pp. 85-94.
The Analysis of Motor Vehicle Registration Records. By G. P. St. Clair, Chief, and Sidney B. Clark, statistician, Div. of Financial and Administrative Research. P.R.A. Sept., Pp. 95-101.

A New Soil-Dispensing Apparatus for Mechanical Analysis of Soils. By A. M. Wintermeyer, H'way Engr., Div. of Physical Research, P.R.A. Sept., Pp. 102-108.

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Taking the Gamble Out of Rock Excavation. By E. T. Nettleton, Assoc. H'way Engr., Connecticut Highway Dept. August, Pp. 94-97.

Effect of Jet Heat on Airport Pavements. By Walter R. Macatee, Mgr., Airport Div., A.R.B.A. August, P. 101.

The Surveyor (England)

Visibility in Road Design. By R. D. Jennings. Aug. 27, Pp. 443-444.

BOOK REVIEW

Public Health Engineering.—By Earle B. Phelps, Professor Emeritus of Sanitary Science, Columbia University, and Professor of Sanitary Science, University of Florida. John Wiley & Sons Co., New York. \$7.50.

This is a remarkable book by a remarkable man. It was written primarily to teach municipal and civil engineers something about sanitary science—what to design and build, and why, in order to protect public health. The subject matter of the book is divided into two parts. One deals with what Prof. Phelps calls "air contact"—that is the problems of air pollution by smoke, odors and noise; ventilation; illumination and lighting; and insect problems. The other is "water contact" and deals with our water resources, stream sanitation, sewage treatment and water conservation.

We have not yet read and studied this book, but we are looking forward with anticipation to doing so. This review is based on advance publicity Reading Prof. Phelps' books is not a thing that can be done in a couple of evenings. Rather than wait until we have profited by this material, we are telling our readers now so that they, too, can make a start.

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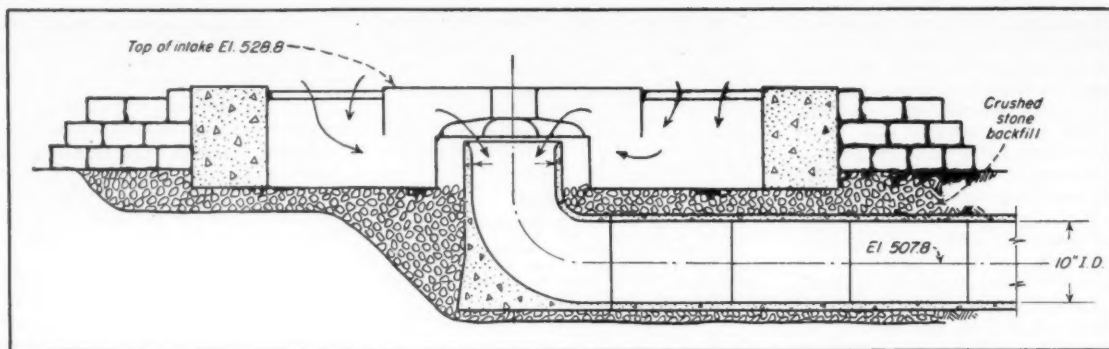
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Section through the Cleveland intake screen.

The Water Works Digest

Metering Successful in Milan

Metering in Milan, Tenn. in 1946-47 has reduced consumption 50% and power costs for pumping 25%. The usual resentment of the public to metering has largely been overcome by patient handling of complaints of individual consumers. Where consumption by industries seemed to be unduly high, investigation was made to discover leaks or wastage. A dairy was shown how to reduce its consumption nearly 50%. A beauty shop consumption was reduced from 177,000 gal. a month to 13,000. Wasteful habits as well as leaks were responsible for high consumption. To satisfy consumers of the accuracy of the meters, in some cases they were taken to the meter shop and watched a meter tested, and this meter was then installed in their own service. In less than 18 months, water account complaints dwindled to a smaller percent than those concerning electric accounts. By pointing out the advantages of metering to the bonding company, the existing 3% bonds were refunded, with an additional \$30,000, at 2½%; the ½% saving in interest being sufficient to pay for the meter installation.

R. T. Hosmon—"Water Metering Solves Milan's Financial Problems"; *PUBLIC WORKS*, September.

Chlorine for Sanitary Purposes

Users of chlorine for sanitary purposes should examine their chlorine procurement procedures and eliminate those practices which may be troublesome to satisfactory supplier-consumer relations. They use only about 3½% of the total chlorine production, and the amount varies with the seasons. The supplier dealt with may change with the administration. The amount used by an individual consumer is small and the attention needed and red-tape are rela-

tively large, cylinder equipment is used less effectively, all of which is inadequately covered by the revenue from such service. In short, the producer is not especially anxious to sell chlorine for sanitary purposes, and users should bear this in mind or they may find their future supply jeopardized.

J. O. Logan—"Chlorine Supply and Demand"; *Journal Am. Water Works Ass'n*, August.

Cleveland's Steel Drum Intake

Cleveland, O., is constructing a new intake, estimated to cost \$6,000,000 and known as the Nottingham intake. Its principal features are a submerged crib in 50 ft. of water 3½ miles off shore; a 10-ft. concrete pipe intake in the bottom of Lake Erie; and a 1½-mi. land section of 10-ft. tunnel. Because of the rock conditions under the lake bottom and recent developments in marine dredging equipment for dredging to depths of 65 ft., the pipe will be laid in open cut deep enough to provide a minimum cover of 4 ft. Each 500 ft. section will be tested under hydrostatic pressure of 10 psi above that due to the lake level.

Because of the scarcity of heavy timbers normally used for submerged cribs, this crib will be made of ¾" steel plate, in the shape of a drum 76 ft. in diameter and 12 ft. deep. Steel surfaces exposed to flowing water will be coated with reinforced gunite ¾" thick; other surfaces with bitumen. The bottom of the drum is floored with steel plate with an 18 ft. hole in the center in which is welded a collar extending 6 ft. into the drum, which will surround the upturned elbow of the intake pipe. (See cut). The drum is divided into three compartments by two concentric octagonal partitions. The outer annular compartment, about 8 ft. wide, will be filled with concrete when the drum is sunk onto its foundation.

Inside this, at the top of the drum, is a screen made of 3" x 12" timbers with 3" clear openings, about 15 ft. wide; and the central 15 ft. is a steel plate. This crib will rest on a foundation of 1½" to 4" broken stone 3½ ft. deep in a pit dug 5 ft. below lake bottom, and will be surrounded with 5-ton stone blocks. Water will enter the crib through the screens in the top deck and pass under one baffle and over another into the intake pipe.

A. A. Burger—"Steel-Drum Crib for Cleveland Intake"; *Eng. News-Record*, Aug. 5.

Air Conditioning Water Rates

Data from cities throughout the United States indicate that air-conditioning loads run from 22 to 100% of the daily average plant output. The use of air conditioning in stores, hotels, etc., is increasing and within the next five years home air conditioning with water-cooled equipment will become a significant factor. As related to this increasing demand for water, cities may be divided into four groups approximately equal in number: 1—Those which must be worrying daily about the adequacy of their supply; 2—those which should be studying or working for additional capacity; 3—those now enjoying safe balances of supply and demand; 4—those which should be encouraging sales to obtain increased revenue. For the 1st group, the restricting of the use of water for air conditioning is almost imperative; for the 2nd it is desirable, temporarily at least. With possible future developments it may be necessary in every city where the supply is not unlimited. Fortunately, during the past 10 or 15 years power rates have been coming down and the cost of water and equipment has been going up, resulting in a general tendency to operate refrigeration systems at higher condensing temperatures; therefore, using more elec-

tric power and less water per ton of refrigeration.

There are two general methods of controlling consumption for air conditioning—prohibiting such use or limiting it by direct regulation, and fixing rates for the water that will discourage use of large quantities. Apparently the most common method of regulation is to restrict the discharge of water into the sewers to a very nominal amount. Where ground water is used, limitation of quantities so used are imposed by some states for the purpose of conservation. Marsden Smith says that there is no more reason for restricting or making special rates for air conditioning water than for lawn sprinkling or swimming pools. "But when special rates can be shown to be definitely necessary for the protection of the utility, they must be made sufficiently high to cover not only the cost of water service, but also the added expense of applying the special rates." An equitable rate based on the actual plant investment plus operating costs required to supply the air conditioning demand would be so high as to be almost prohibitive. In the case of flat rates, these would probably be based on service size.

Frank C. Amsbary, Jr., Elwood L. Bean, Ted H. Kain, Lynn B. Mighell and Marsden C. Smith—"Rates and Regulations for Water Used in Air Conditioning"; *Jour. Am. Water Works Ass'n*, August.

A Rational Theory of Rapid Sand Filtration

This article is devoted to the development of a rational theory covering the functioning of the rapid sand filter. A particle of floc bridging a pore in a filter has to withstand the pressure of water flowing through the filter, and its strength may be expected to be a function of the largest size of pore it will block; and this is proportional to the third power of the diameter of the particles. Data from filter operations indicate that, for a given water, $\frac{hm^3}{l}$ is a constant, in which h is the loss of head at which the floc begins to pass through a bed of depth l , and m is the "effective size" of the particles in the filter medium. This constant he calls the "floc strength index." When the floc is so weak that it is difficult to produce clear water by filtration, the floc strength index can be increased at least sixfold by silica treatment.

H. E. Hudson, Jr.—"A Theory of the Functioning of Filters"; *Journal, Am. Water Works Ass'n*, August.

Use of Hypochlorites

The Ohio Health Dept. advises that a hypochlorinator rather than a chlorinator be considered for any quantity of water less than 250,000 gpd, and that it be used for 100,000 gpd or less. Hypochlorinators are favored from the standpoint of safety and are easy to maintain when not in use. There is a quantity above which it is more eco-

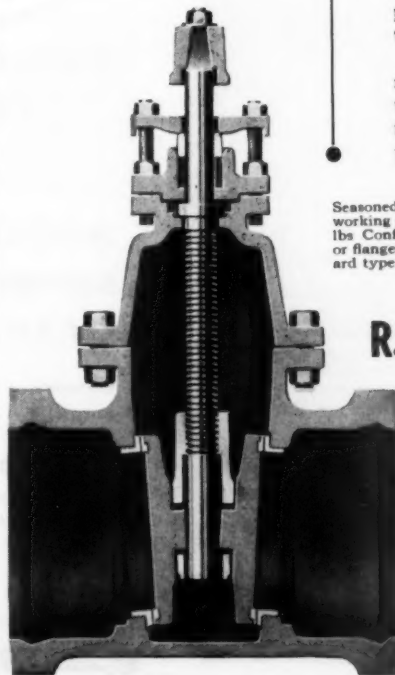
nomical to use a vacuum liquid feed machine, and such machines are generally used for swimming pools of more than 100,000 gal. capacity. In Massachusetts, hypochlorites are found to be economical for small water supplies. The Michigan Health Dept. attempts to get liquid chlorine machines in all plants where chlorination 24 hr. a day is necessary, but hypochlorites are permitted for some well supplies. The Indiana Board of Health considers hypochlorites are most suitable for sterilizing wells and small distribution systems, but reach their practical limits on pumps of 100 gpm capacity (144,000 gpd), and are not favored unless

the supply crotch can hold enough solution for 30 hr. operation. In Tennessee, hypochlorinators are used for 28 water supplies, and in 9 others serve as standby for gas machines. Geo. C. Fassnacht says: "The results obtained are usually in direct proportion to the skill of the operator. . . . Failures in small plants . . . are practically always due to failure in the process, of introducing the chemical."

In addition to their use for small water supplies, hypochlorites are advantageous for emergency disinfection of mains, wells and reservoirs. Using hypochlorite, an engineer or chemist may go into the field without other

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Seasoned castings. Rigidly inspected. For working pressures up to 175 lbs. Tested to 300 lbs. Conforming to AWWA specifications. Bell or flanged ends, or to connect with any standard type of joint. All sizes 2" to 30".

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Manufacturers of Mathews Hydrants and "Sand-Spun" Pipe (Centrifugally Cast in Sand Molds)

equipment than a residual chlorine testing apparatus and arrange for disinfection of smaller water supplies.

"Using Hypochlorites," a compendium of opinions of officials of the State Boards of Health of Ohio, Massachusetts, Michigan, Indiana and Tennessee. *PUBLIC WORKS*, September.

Incomes from Reservoir Lands

Akron, O., owns 8,000 acres of land around a reservoir, of which 600 acres is in maple sugar bushes, 2600 acres in farm land leased to 64 farmers, 1200 acres of pasture for sheep and cattle and farm land for raising their feed, and 2100 acres in forest, wood lots and swamp. From these it has obtained an average annual income of \$1,100 from maple syrup, \$2,300 from lumber, \$2,200 for wool, \$400 for sheep sold, \$8,500 for cattle, \$5,500 from land rental, and \$1,400 from hay and other sources; a total of \$21,400. Operating expenses averaged \$19,300. In addition, the projects afford a means of maintaining the unused property in good condition and are conducive to better public relations.

Newark, N. J., which owns 35,000 acres of watershed, has sold \$10,000 worth of spruce for Christmas trees, at an average price of 40c a stump, with \$1 per linear foot for large trees. Boughs

of pine and spruce are sold for \$10 a ton on the tree. Other trees are sold for mine props and other mine timber. The cost of forestry work, including the forester's salary, is about \$6,000 a year and the income at present is about the same, but it is estimated that in 20 years the income will have increased to \$35,000 and the cost of operation, marking, supervision, etc., to not more than \$18,000.

Wendell R. La Due and John M. Heilman—"Reservoir Lands Pay Their Way"; *Journal, Am. Water Works Ass'n*, August.

Cutting C. I. Pipe With the Oxygen Arc

Cutting large cast-iron pipe in the trench with hand chisels is a difficult, slow job. A Strickler pipe cutter is much more satisfactory. At Hartford, Conn., two cuts were made in a 42" c. i. pipe, which had a wall thickness of 2", using an air wrench to drive the machine, in 4 hr., with an additional 3 hr. for installing and removing the cutter, which is quite heavy. The cost of this was \$124.71 for rental of cutter and freight, \$57.00 for rental of air compressor and crane, and \$43.05 for labor. On the same job the "Oxyarc" cutting method was tried. The cutting time was 4 hr., (can perhaps be reduced to 2 hr. with experience); rental of machine and welder cost \$84.00, crane (for removing section of pipe) \$12.50, and labor

\$3.85; a total of \$100.35 as compared with \$224.75 by the other method. Also the main was shut down for a 3-hr. shorter period. In this method of electric welding, the welding rod is hollow and oxygen is fed through it right into the arc, raising the temperature to approximately 10,000°. For cutting a pipe 2" thick the total cost is divided as follows: Cutting rod, 59%; oxygen 18%, labor 21%, current 1 to 2%.

Sherman L. Rogers—"Experience With the Oxygen Arc Method of Cutting Cast Iron Pipe"; *Water and Sewage Works*, September.

Metering at Naugatuck, Conn.

The Naugatuck, Conn., Water Co. adopted universal metering in 1945. In 1946 the unaccounted-for water was shown by metering to amount to 25%. A Pitometer survey located two cases of use of large quantities of unmetered water from fire lines. Eliminating these and other losses reduced the unaccounted-for water in 1947 to 14%, with no allowance for flushing and other legitimate uses. This saving plus that directly due to metering made available an additional 1,000,000 gpd, worth \$29,200 a year, with an investment of \$35,000.

To satisfy complaints of high meter bills, over a fifth of the homes in the city were inspected, and in many cases the hour-by-hour consumption ascer-

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tained by use of a Brainard water meter. These personal interviews with consumers were utilized to explain the advantages and fairness of metering and correct many erroneous ideas they held concerning the business of the company.

William H. Moody—"Results of Universal Metering at Naugatuck, Conn." *Water and Sewage Works*, September.

Determining the Most Economical Distribution System

The author discusses the problem of finding the most economical combination of pumping capacity, transmission main sizes, elevated storage and pumping head to serve a community at the lowest annual cost. His analysis indicates that present practice is to use uneconomically large pipe and low pipe velocities. The losses of head in the economical main sizes would not result in unreasonably high pumping pressures in systems in flat terrain.

The value placed on money for capital investments has an important bearing on the economical diameter and on the total investment required. The effect of different assumed interest rates is so great that engineers should concern themselves with the basic factors influencing the choice of an interest rate for economic studies and should develop a rational method for selecting that rate.

It cannot be categorically stated that elevated storage for equalizing purposes to reduce main and pumping station costs in systems in flat terrain can be justified. Such justification depends upon the length of the system, in addition to the other variables in the problem.

The design of pumping facilities for a system with economical mains and without elevated storage presents some problems which should stimulate pump designers to improve the flexibility and range of operation of centrifugal pumps.

A reduction in the cost of pumping facilities, such as might be possible by the use of outdoor pumping units and substations, will minimize the amount of elevated storage which can be justified for equalizing purposes.

The usual method of operation of systems, in which elevated storage floats on the line, is wasteful of energy.

Vance C. Lischer—"Determination of Economical Pipe Diameters in Distribution Systems"; *Journal Am. Water Works Ass'n*, August.

Metering for New York City

The officials of New York City Water Department have for years recommended metering of multiple-family dwellings in that city, but with little result until, in a report dated June 28, 1948, such metering was recommended by the Mayor's Executive Committee on Administration consisting of the President of the Board of Transportation, Director of the Budget, Commissioner of Licenses and Commissioner of Public Works. The committee noted that the demand this year will be 1170 mgd while the dependable safe yield is but

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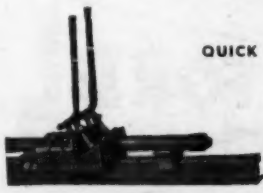
Think of the time, labor and inconvenience this saves! Eliminates extensive ditching as just a short trench accommodates the pusher...no tearing up of pavement, lawns, floors...eliminates back-filling, tamping, tunneling, repaving. Cuts job time to a fraction!

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Portable—compact, easy to carry to job and set up.
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1045 mgd, and not even in 1955, when the Delaware river development becomes available, will the safe yield equal the estimated demand; therefore it seems imperative to reduce the demand, and to do this, metering seems to be the only remedy. A survey made in 1939 showed that, in unmetered dwellings, the average per capita consumption in one-family houses was 56 gpd; in 2-family it was 66 gpd, and in dwellings of more than 2 families, 89 gpd. The report estimates that by metering dwellings of more than 2 families about 20% of the water demand could be saved. This metering would cost \$30,000,000, but would save a capital outlay of \$125,000,000 for

additional supply. The program proposed is to meter at once all new multi-family dwellings; within two years all housing 20 families or more; within three years, all housing 10 families or more; and within five years, all housing more than 2 families.

"Metering Urged for N. Y. City to Avert Water Shortage"; *Water Works Engineering*, August.

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Water Service Co.; Elwood L. Bean, Prin. Asst. Engr., Philadelphia Bureau of Water; Ted H. Kain, Gen. Mgr. Columbia, Pa. Water Co.; Lynn B. Mighell, Carrier Corp.; and Marsden C. Smith, Chf. Engr. Dept. of Public Utilities, Richmond, Va. August, Pp. 809-820.

Balanced Use of Reservoir Lands. By Wendell R. La Due, Supt. Bureau of Water & Sewerage, Akron, O. August, Pp. 827-830.

Income from Water Department Property. By George F. Hughes, Exec. Secy Denver Bd. of Water Commissioners. August, Pp. 830-832.

Forestry on Reservoir Lands. By John M. Heilman, Forester, Newark, N. J. Div. of Water. August, Pp. 832-836.

Chlorine Supply and Demand. By J. O. Logan, Asst. Genl. Mgr. of Sales, Mathieson Chemical Corp. August, Pp. 837-841.

Dealing With the Public in Obtaining Rate Increases. A panel discussion. By Leonard N. Thompson, Gen. Mgr. Water Dept., St. Paul, Minn.; Rennie I. Dodd, Exec. Mgr., Chester, Pa. Municipal Authority; and Wm. R. Wise, Mgr.-Engr. Com'r of Public Works, Newberry, S. C. August, Pp. 842-848.

Determination of Economical Pipe Diameters in Distribution Systems. By Vance C. Lischer, Horner & Shifrin, Cons. Engrs. August, Pp. 849-867.

A Theory of the Functioning of Filters. By H. E. Hudson, Jr., Head, Eng. Sub-div., Illinois State Water Survey. August, Pp. 868-872.

Prevention of Underground Leakage. By Loren E. Blakeley, Cons. Engr., Santa Ana Valley Irrigation Co., and Victor A. Endersby, Engr. in Charge, Asphalt Dept., Shell Development Co. August, Pp. 873-882.

Public Works

An Interesting Chlorinator Installation. By M. J. Shelton, Gen'l Mgr. & Chf. Engr., and L. L. Fior, Chemist, September, P. 19. Water Metering Solves Milan's Financial Problems. By R. T. Hosmon, Supt. Electric & Water Dept. September, Pp. 20-21.

Acid Treatment of Wells. By Guy Peton, Superintendent, Indian Lake, N. Y., Water District. September, P. 29.

Using Hypochlorites. By F. H. Waring, Chf. Engr. Ohio Dept. of Health; Arthur D. Weston, Dir. of San Eng., Mass. Dept. of Public Health; Raymond J. Faust, Chf. Div. of Water Supply, Mich. Dept. of Health; George C. Fassnacht, Chf. of Water Supply Div., Indiana Bd. of Health; Willis H. Lewis, Prin. Engr., Div. of San Eng., Tennessee Dept. of Health. September, Pp. 36, 38, 40.

A 2700-Ft. Line to Serve 12 Customers. By H. A. Gilbert, Sec'y & Treas., Water Dept., Corry, Pa. September, P. 44.

Water and Sewage Works

Experience With the Oxygen Arc Method of Cutting Cast Iron Pipe. By Sherman L. Rogers, Supt. of Distribution, Hartford Met. Dist. Water Bureau. September, Pp. 308-309.

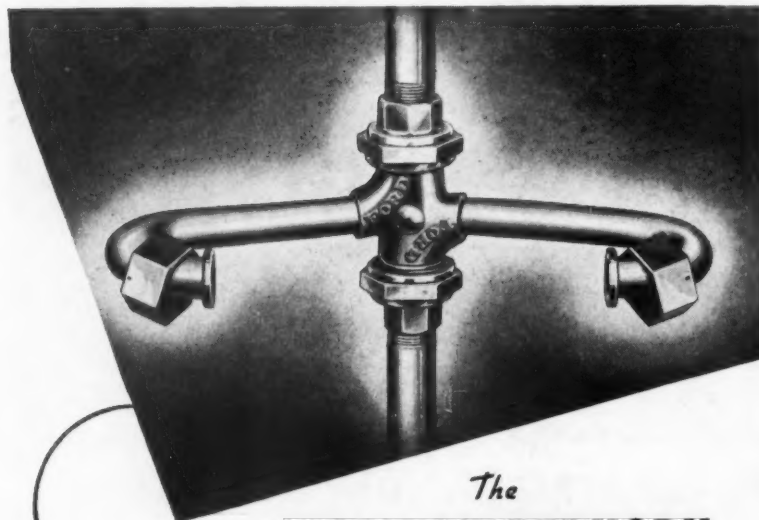
Our (Public) Relations Are Always With Us. By John E. Kleinhenz, publicity and advertising, Indianapolis Water Co. September, Pp. 310-314.

Results of Universal Metering at Naugatuck, Conn. By Wm. H. Moody, Pres. & Gen'l Mgr., Naugatuck Water Co. September, Pp. 317-319.

Discharge Coefficients for Water Pipe. Their Preservation and Restoration. By W. L. Lea, consulting engineer. September, Pp. 320-324.

Industrial Sanitary Engineering Training

New York University and Bellevue Medical Center have established an Institute of Industrial Medicine in which training will be provided for sanitary engineers in industrial hygiene. This course is under the direction of Dr. A. J. Lanza who developed the Army industrial hygiene program during the war. His presence guarantees full consideration to engineering problems. Many Sanitary Corps officers were assigned to serve under him in the war-time program and he is familiar with the values, and with the needs of engineering skills.



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Industrial Waste Treatment

IN 1923 the Bureau of Sanitary Engineering of Maryland, G. L. Hall, Chief Engineer, made its first studies on the treatment of the wastes from the plant of Congoleum-Nairn, Inc., at Cedarhurst, and in 1925 an experimental plant was operated by the company to confirm by plant operation the results of laboratory tests made two years previously. As a result of these experiments a treatment plant was installed in 1927 which provided coagulation and settling in lagoons for all the waste waters. During 1946, in anticipation of an increase in the size of the paper mill and because the North Branch of the Patapsco River is being developed as an additional source of water supply for Baltimore City, further experimental studies were made to determine treatment requirements. At meetings held during 1946 the industry agreed to produce an effluent which would not be harmful to the river if used as a source of water supply. During 1947 final plans for the treatment plant were approved by the Bureau and construction begun. The treatment plant will provide for settling, high rate filtration and chlorination of all the wastes from the mill. Sludge will be thickened, digested and dried, although the digestion step is an experiment as there are no available data on the digestibility of the solids from this type of waste. It is expected that the treatment plant will begin operating during this year.

Arrangements were made by the Bureau with the officials of a distillery at Loreley, whereby lagoons were constructed to receive the stillage. Sodium nitrate was added to the stillage, as it entered the lagoons. This is probably one of the first experiments in the application of sodium nitrate to distillery wastes prior to lagooning. Production of odors was materially minimized through the use of this chemical. Further studies will be undertaken when normal plant production is resumed.

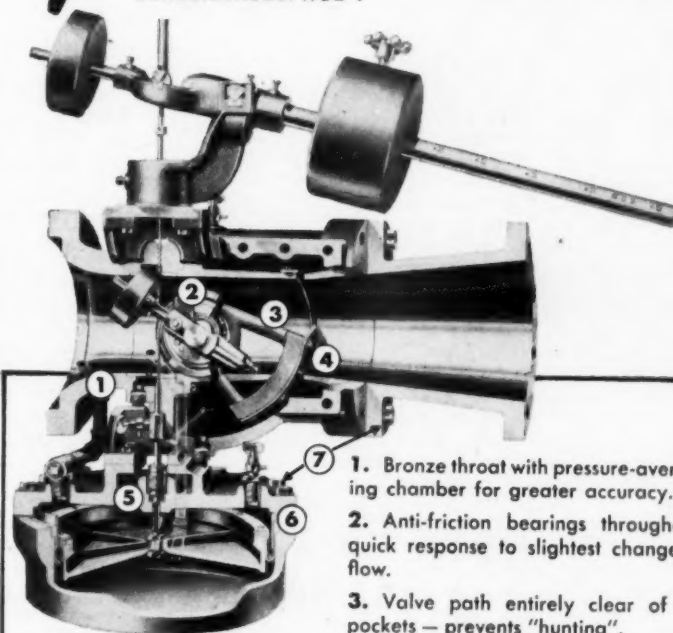
During 1946 the Whiteford Packing Company, at the suggestion of the Bureau, constructed a lagoon into which wastes from corn processing were discharged after passing through a 40-mesh rotary screen and were then treated with sodium nitrate. During that season the wastes produced in processing other vegetables, including peas, beans and carrots were discharged directly to a

small creek adjacent to the plant. In 1947 a second lagoon was constructed and no processing wastes entered the creek. These were screened, treated with sodium nitrate and discharged to the two lagoons which are of sufficient capacity to hold the total volume of wastes produced during the entire year. The operation of this method of waste treatment was satisfactory. Analytical data showed

that the biochemical oxygen demand of the wastes in the lagoons reached a maximum of approximately 700 p.p.m. during 1947 as compared to more than 2,000 during 1946. Following the 1946 packing season, the biochemical oxygen demand of the lagoon wastes were not sufficiently reduced to discharge into the creek until April, 1947, whereas this year (1947), with all the wastes entering the lagoons, the BOD of the lagooned material had by December equaled that reached in March following the previous year's operation.

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The Sewerage Digest

Treating Metal-Working Wastes

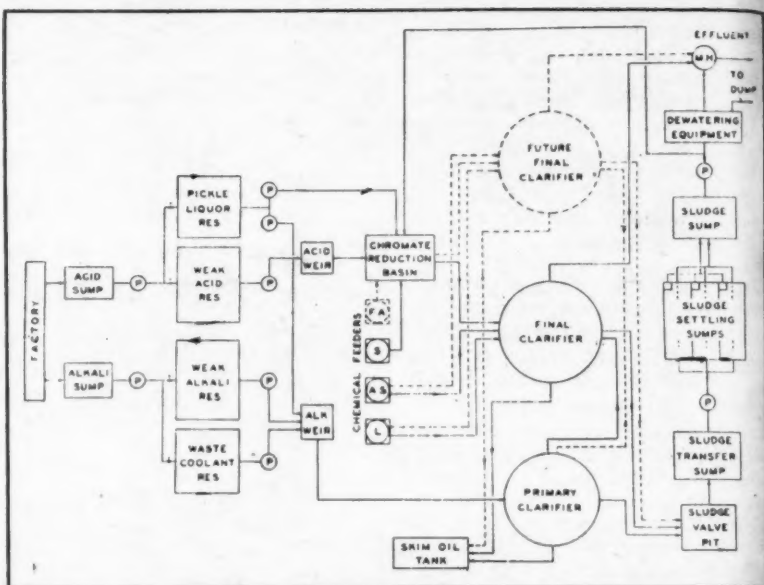
The Sandusky, O., plant of the General Motors Corp. discharges its wastes into a creek that has practically no flow at certain seasons of the year, passes through farm land and a golf course and empties into Lake Erie. The Ohio health authorities established as maximum concentrations permitted in the plant stormwater discharge into this creek, chromium 2.0 ppm; emulsified oils 30.0 ppm; suspended solids 20.0 ppm; pH range 7.0-10.00. The plant wastes originate chiefly with alkali-cleaning machines, steel pickling, chrome plating and renewal of coolant make-up tanks. The spent pickle liquor and weak-acid waste neutralizes the soluble oil, lime and alkali-cleaning agents, and crack part of the soluble oil from the make-up tanks. To permit securing uniformity of rates of flow and of composition, reservoirs receive separately the four major types of wastes—weak alkali, weak acid, pickling liquor and spent coolant.

Five methods of disposal were analyzed, and chemical treatment was chosen as being highly flexible, permitting handling of wide ranges of concentrations and quantities, and requiring minimum labor and power costs. A plant was designed to handle a total of 125,000 gpd of weak alkali and 85,000 gpd of weak acid—75% of it in an 8-hr. operating period. The treatment consists of (1) primary clarification for partial separation and removal of soluble and insoluble oils; (2) chromate reduction to reduce the chromium in the weak acid wastes; (3) final clarification and neutralization; (4) sludge dewatering and disposal. The primary clarifier is a conventional design used in sewage treatment. The effluent from this combined with the discharge from the chromate reduction chamber is introduced into a central inlet chamber of the final clarifier, where it is mixed with lime and activated silica and some slurry. Sludge is pumped to settling basins, and from these to a lagoon.

Harry D. Unwin—"Treating Metal-Working Wastes"; *Eng. News-Record*, Aug. 19.

Periodicity in Filter Dosing

Commencing in 1943, the Halifax sewage dept. has investigated the effect of different frequencies of dosing of percolating filters. Laboratory tests were followed by using two of the 46 circular filter beds in the plant, 65 ft. in diameter, for the experiments. The medium in both beds was slag, graded from 3" at the bottom to 3/4" at the top. The distributors were 4-arm rotary. Both



Courtesy Engineering News-Record

Flow diagram for metal working wastes treatment.

were fed at the same rate (180 gpd per cubic yard), but speed of revolution on one bed was reduced by turning one arm to discharge in the opposite direction and by hanging one or more light chains from the arms. In this way the frequency of dosing each portion of this bed was varied in the different experiments from once in 11 seconds (the rate at which the control bed operated) to once in 64 seconds. After a year of operation (1944-1945), the dosing was reversed, the bed which had formerly been the control becoming the test bed. Within two months after this reversal the relative efficiencies of slow and rapid dosings became the same as during the first test, proving that the characteristics of the beds themselves did not affect the results. With 11-second intervals the average BOD was reduced from 157 ppm to 23.2, while with 64-second intervals it was reduced to 18.3; and the nitric N averaged 6.6 ppm in the former effluent and 10.8 in the latter. The latter bed also kept in a cleaner condition. The author believes that "the greatest factor in the improved results observed lies in a physical and mechanical effect in breaking up surface growths and washing these downwards into the filter. . . . Lengthening the period between individual doses, by increasing the magnitude of the flushes, will enhance this physical effect, but beyond a certain point risk must arise of much of the applied feed passing so rapidly through the bed as not to be efficiently purified.

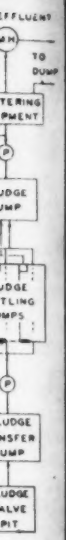
It is probable the optimum dosage frequency is that which is long enough to afford an appreciable flushing action on the surface of the filter and yet short enough to give a reasonable spreadover on passage through the bed."

C. Lumb and J. P. Barnes—"The Periodicity of Dosing Percolating Filters"; *The Surveyor*, July 30.

Wall Heating Of Digestion Tanks

Heating of digestion tanks by means of pipe imbedded in the walls permits approach to adiabatic sludge digestion conditions. The percentage of sludge within 12" of the walls and floor is a considerable proportion of the total in a small tank. The pipe coils should be grouped into several banks, each controlled by a gate valve, permitting control of heat input to the top, middle or bottom of the wall, or the floor. By raising the heat around the scum blanket, more rapid digestion takes place here and heavy greases are kept liquid. Maintenance and operation costs of this type of heating are negligible. In climates where the raw sludge has an average temperature below 60°F it is probably advisable to pass it through a heat exchanger on its way to the digester, bringing the temperature up to 90°.

Several materials can be used for the piping, but wrought iron or steel has the advantage that its coefficient of expansion is very nearly that of the concrete in which it is imbedded, while that of

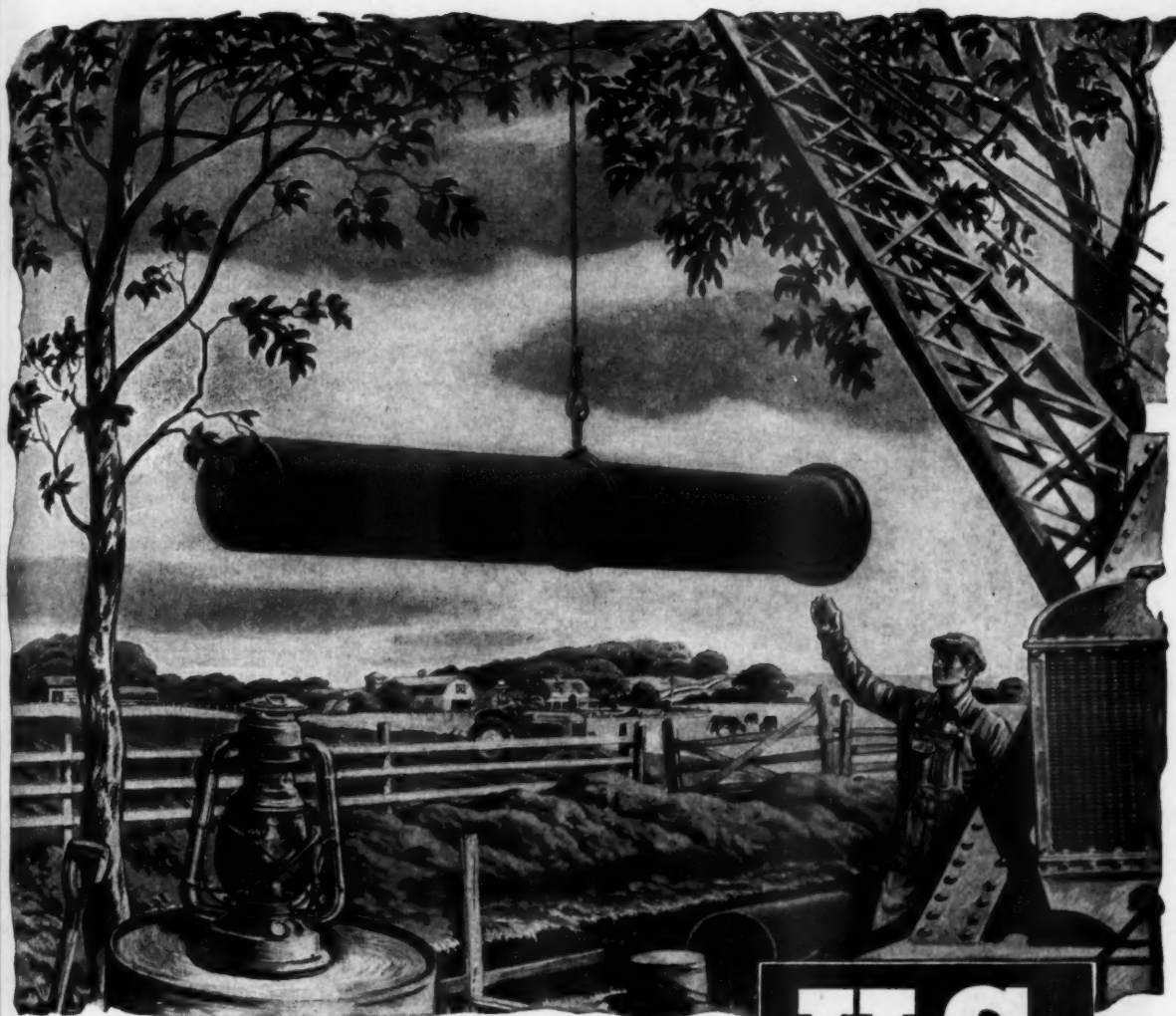


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copper is 40% greater, and that of aluminum 80% greater.

V. A. Vaseen—"Reducing Heating Maintenance Cost on Sewage Treatment Digesters"; *PUBLIC WORKS*, September.

Replacing a Collapsed Sewer Arch

An explosion in a sewer in Terre Haute, 84" and 92" in diameter, built of 3 rings of brick work, caused 2825 ft. of the arch to be so damaged that it had to be replaced; beyond this the damage was less, so that sealing it with gunite was practicable. The invert was

not damaged. Three methods of replacing the arch were considered—3-ring brick, estimated to cost \$45 per lin. ft.; reinforced concrete, estimated at \$40; and corrugated steel arch, estimated at \$18.70. The last was chosen, using an arch of three plates, bituminous-coated. In placing the arch, the old brick was removed down to the springing line and a trough of reinforced concrete cast on top of the brick, into which the bottom of the arch was placed and the trough filled with asphalt. At the ends of the new arch the old brick was cut back to give a square face, against which the steel arch butted, and the space between brick and

steel was filled with concrete. The repairs to the old arch were made with gunite 2" thick, reinforced with wire mesh.

R. E. Hutchins and A. J. Nehf—"Steel Arch Construction Expedites Repair of Explosion-Damaged Sewer"; *Civil Engineering*, September.

Jacking 123 Feet Of 36-Inch Sewer

At Ames, Ia., it was necessary to run a 21" sewer under an 8-track railroad crossing. The contractor chose to do this by jacking a 36" pipe (the smallest size in which a man can work effectively) and placing in this, after the entire 123 ft. had been jacked through, a concrete invert with 10½" radius for about 1/3 of the circumference. This permitted compensating for any slight errors in grade and alignment. The pipe was pushed with two 100-ton hydraulic jacks. The highest pressure, with the last pipe in place, was 57 tons per jack. The average movement during actual jacking was 0.6 fpm. Ten 2-shift days of jacking operation were required. The soil was typical blue-gray glacial till with gravelly sand admixture. Best results were obtained by excavating slightly less than the periphery of the pipe and allowing it to shave the holes as it was pushed forward. A man in the pipe excavated with a pneumatic spade and another just behind him placed the material in a small rubber-tired cart by which it was hauled back to the operating pit.

Robert E. Snetzer—"Job-Built Rig Jacks 123 Ft. of 36-In. Pipe Under Railroad Right-of-Way"; *Civil Engineering*, September.

Trickling Filters For Paper Mill Wastes

"Until some entirely novel means of stimulating filter activity is found, this form of treatment is not applicable to the bulk of the waste waters discharged by alkaline process pulp and paper mills with the possible exception of very small manufacturing units. . . . They may be employed in some instances for handling certain portions of the waste or for effecting a polishing treatment following another process able to cope with the bulk of the waste more efficiently." But "this form of treatment would require expenditures for treatment works of the same order as the investment in the mill itself."

Harry W. Gehm—"Trickling Filters for Treating Pulp and Paper Mill Wastes"; *Water & Sewage Works*, July.

A Large Automatic Sewage Pumping Station

Baltimore, Md., has installed at the Dundalk sewage pumping station one of the largest automatic pumping plants in existence. An 8,000 gpm and a 12,000 gpm pumps are in operation and space is provided for two 14,000 gpm pumps in addition. The station is unattended except for a daily visit by a maintenance man. Control mechanisms are connected



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Figure No. 58C
Figure No. 440
Figure No. 450

S-6

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to alarms in the Eastern Ave. pumping station by a pair of underground telephone cables. Alarms sound if there should develop low vacuum in the pump priming system, low oil pressure in the accumulator tank, low pressure in water-seal piping to sewage pumps, low or high sewage level in the suction well, electric power failure, or high water in sump-pump pit.

On entering the station, the sewage passes through an 8 ft. mechanically cleaned screen, the screenings being ground and returned to flow; then into the suction well, which is ventilated by a 4700 cfm fan. It is pumped against a 105-ft. head by slow-speed pumps (702 and 585 rpm respectively). Operation of pumps is controlled by float switches, each pump starting at its slowest speed, which is increased automatically if the sewage continues to rise. Two vacuum priming pumps are controlled by four automatic switches, one of which operates one vacuum pump, the second starts the second vacuum pump if necessary, the third shuts off the pumps at a predetermined high vacuum, and the fourth sounds an alarm in the Eastern Ave. station when the vacuum is dangerously low. The discharge is measured by a Venturi meter, the piezometer openings of which are cleaned by six hydraulically operated valves. Water for these and for the sewage pump stuffing boxes is furnished by two small centrifugal pumps. The station is windowless, and the ventilating fan can change the air in the suction well every 7 min.; and the pump and transformer rooms are ventilated through the roof. Stand-by power will be provided by diesel or gasoline engines direct-connected to a 2300-v. generator.

C. E. Keefer — "Pumping Sewage Automatically"; *Eng. News-Record*, Sept. 2.

A Plant at 10,000 Ft. Elevation

The Leadville, Colo., sewer system extends upward to 10,276 ft. above sea level, and its proposed treatment plant will be at elevation 9,960. Freezing weather can be expected every night from October through May, and occasionally during June and September. An average 24-hr. temperature of -30° has been recorded. Frost normally goes 6 to 8 ft. deep. These conditions necessarily affect the design. Sewers are buried to a minimum depth of 7 ft. The grit chamber and dosing tank, as well as the pumps, chlorinator, etc. are all placed in a heated building. The standard-rate trickling filter 82 ft. in diameter is enclosed, for which reason fixed nozzles are used instead of a rotary distributor. The filter enclosure is heated by a gas-fired forced-air circulating heater of 166,000 B.t.u. capacity. A chlorine contact basin is buried wholly below frost line.

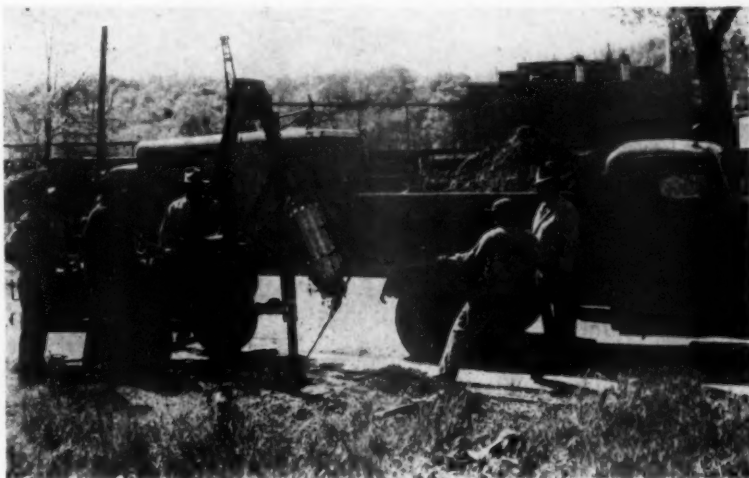
The digester, 30 ft. in diameter, is to be very well insulated, with 4" of rock wool in the roof of the floating cover, and 8" of rock wool around the wall above ground. Heating coils of

1 1/4" w. i. pipe are placed at 15" centers in the wall and 18" centers in the floor. These are divided into three banks, the bottom, lower wall and upper wall. Ordinarily those in the bottom will not be used; but for mixing or seeding, the walls can be kept cool and the bottom heated. It is intended to use a small heat exchanger to heat raw sludge as it is added to the digester. It is anticipated that the digester gas will not be sufficient to supply all the heat needed in the coldest weather.

V. A. Vaseen — "World's Highest Sewage Plant Built at Elevation of 10,000 Feet"; *Sewage Works Eng.*, September.

Treating Wastes With Water-Softening Sludge

The sludge resulting from water softening, consisting principally of calcium carbonate and magnesium hydroxide, has a considerable absorbing power for oils and greases, and also is able to remove colloidal organic matter by absorption and coagulation. Pilot plant studies to obtain definite data regarding the possibility of using it for treating wastes and domestic sewage showed that it "appears to have remarkable absorbing and coagulating ability and even after absorbing oil up to 50% of its dry weight it still retains excellent dewatering characteristics. In treating raw do-



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THE "FLEXIBLE" POWER BUCKET MACHINE

is shown finishing a line cleaning job for the Borough of Wallingford, Conn. Original recommendations specified dig-up and replacement. The "Flexible" Power Bucket Machine, however, completed the entire project in 4 1/2 hours. On estimated savings, the machine paid for itself and then some on one short job!

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mestic sewage, such softener sludge, together with a small amount of alum, has effected BOD reductions up to 80% in treating units having a total retention time of only 1 hour. The sludge is most efficiently utilized when it is maintained in the form of a fairly heavy circulating slurry and is thoroughly mixed with the incoming raw waste or sewage such as is accomplished in an "Accelerator." Sludge from treating oil by this method, although containing 38% to 91% of oil, dewatered readily on sand to the consistency of axle grease. The tests with domestic sewage were made at Daytona Beach, Fla., and led to the adoption of a plant at that city (now under con-

struction) using Accelerators and vacuum filters, and to the designation of the process as the "Daytona Beach process."

A. A. Kalinske—"Wastes Treatment in Pilot Plant Using Water-Softening Sludge": *Sewage Works Eng.*, September.

Small Welded Imhoff Tanks

In the vicinity of Wilmington, Del., there are approximately 50 communities with an average population of 400 which it is impracticable to sewer and where soil and ground-water conditions make septic tank and seepage field disposal unsatisfactory. An alternative method

was sought. Since the raw effluent from a properly operated Imhoff tank is much less objectionable than that from a septic tank, and the Imhoff tank requires not more than a fifth of the volume of an equivalent septic tank, the former type was adopted. Five alternate designs were made for a tank for 250 to 300 persons, with 2080 gal. sedimentation chamber volume and 2820 gal. digestion chamber. A conventional rectangular reinforced concrete tank was estimated to cost \$2553; one of creosoted timber, \$2606; a circular concrete tank with steel baffles, \$2157; a riveted steel circular tank 9 ft. diameter and 16 ft. 11" deep, \$3,000; and one like the last but with welded joints, \$2,175. The last was adopted, and the cost given is that for which four tanks were contracted. It is believed that with quantity production the cost could be reduced \$300 or \$400. The circular concrete tank with steel baffles might cost less, but would have no salvage value, while that of the welded tank is estimated at 50% after 3 yr. use.

John J. Cahalan—"Small Welded Imhoff Tanks"; *Sewage Works Eng.*, September.

Filtration of Effluents From Secondary Treatment

Effluents from modern coarse-grain percolating beds and from activated sludge plants contain fine humus or activated sludge which cannot be removed by settlement. If filtered through sand, these suspended matters form a very thin layer and gelatinous seal to the surface, which can only be removed by backwashing or by drying the bed and letting the sealing layer cure up. In a study of treatment of sewage at Johannesburg, South Africa, either sand or land filtration of plant effluents was found practically to eliminate cysts and ova of parasitic worms (which were found in 40% of the effluents), but such filtration had little effect in reducing B. Coli. Sterilization by chlorine is not easy, the cost is generally prohibitive, and the residuals may be fatal to fish. The author apparently recommends the adoption of rapid sand filters similar to those used in water works practice.

Harold Wilson—"Secondary Mechanical Filtration of Sewage Effluents"; *The Surveyor*, July 9; *Municipal Engineering*, July 16.

Filtration of White Water

Extraneous inert materials, particularly the diatomaceous siliceous earths, have been developed for use as filter aids in industrial filtration. For paperboard white water filtration, tests were made with "Hyflo super-cel," "Celite," and "Dicalite," with vacuum and with pressure filtration. The studies indicated that "use of filter aids for clarification of boardmill is not commensurate with the cost, or in comparison with chemical treatment, but the possible economic feasibility of filtration for the removal of suspended solids from the mill effluent

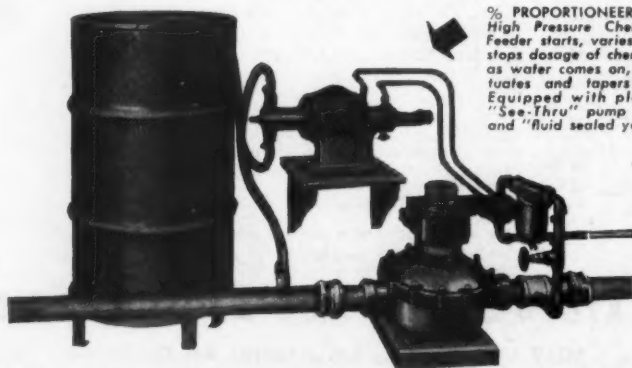
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and recovery of fiber and filter aid by incorporation into the product is indicated."

Willem Rudolfs and Earl J. Axe—"White Water Treatment and Recovery"; *Water & Sewage Works*, July.

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Bid Prices and Cost Estimates

Following are government estimates for work on the Benbrook Dam and Reservoir, Texas:

Clearing the construction site, 70 acres, \$19.58 per acre; grubbing, \$16.88 per acre; stripping, 50,000 cu. yds., 32.0¢; embankment excavation foundation, 180,000 cu. yds., 33.9¢; common excavation, 706,000 cu. yds., 17.54¢; borrow excavation, 5,200,000 cu. yds., 17.04¢; rock excavation, 149,000 cu. yds., \$1.183; structure backfill, 5,070 cu. yds., \$2.23; additional compaction, 4,960 roller hours, \$9.17; concrete in roadway, curbs and spillway apron, 6,490 cu. yds., \$15.82; concrete in wingwalls, abutment and training walls, 3,790 cu. yds., \$34.08; concrete in gravity sections, 10,500 cu. yds., \$15.36; metal water stops, 1,020 ft., \$2.87.

The total government estimate was \$3,172,153. Bids ranged from \$4,263,245 and \$4,695,212 to a high of over eight million. However, of nine bidders, four were under five million dollars.

Dairyland Dam, Wisc.

There were two bidders on the construction of the Dairyland Dam and Power plant. Bid prices on some items were: Class "A" excavation, 85,000 cu. yds., \$1.60 and \$2.50; overhaul, cu. yd. per 100 ft., 1¢ and 3¢; impervious rolled fill, 204,000 cu. yds., 50¢ and 85¢; pervious rolled fill, 733,000 c.y., 53¢ and 85¢; rolling for additional 2 trips, 2¢ and 6¢; concrete in bulkheads, 24,970 c.y., \$14.90 and \$19.50; concrete in powerhouse substructure, 6,450 c.y., \$27.90 and \$35.50; asphaltic expansion material, 6,000 sq. ft., 50¢ and 85¢; copper water stops, 2,000 lin. ft., \$3.75 and \$3.50; furnishing structural steel, 306,000 pounds, 17.8¢ and 21¢, and erecting it, 5.7¢ and 14¢. The two bids amounted to \$5,191,097 and \$5,595,811.

Preventing Foaming of Bituminous Material

Every bituminous user has, at one time or other, been plagued with foaming of hot material when water happened to get into it. This foaming sets up a serious hazard, as everyone knows, and up until lately, presented quite a problem.

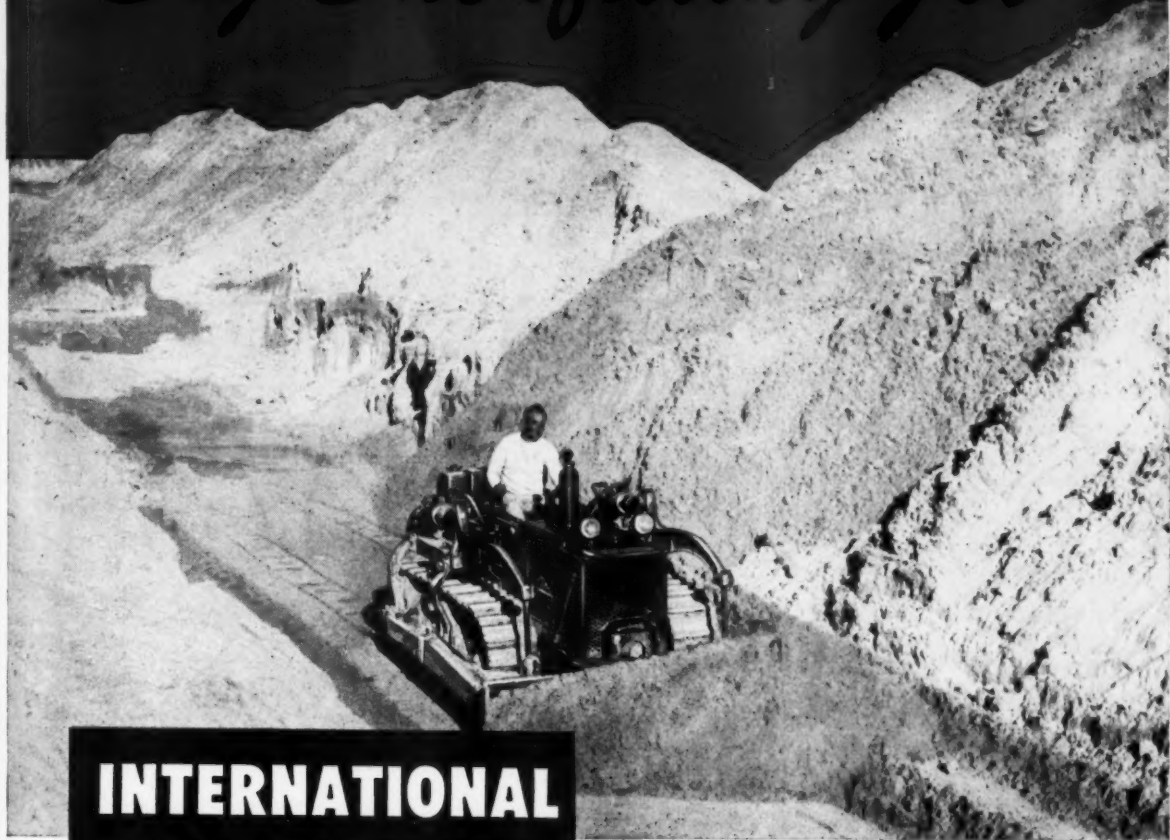
Dow Chemical Company of Midland, Michigan, has now come to the rescue by compounding a material which will overcome this foaming by adding a cupful to a tank car. This material is known as D. C. No. 200 Silicone-fluid viscosity 1000—Centistokes @ 25 deg. C.

Be sure to make a record of this in your Service Department. It would be our suggestion that you also put a supply of this compound in your stock and provide a small amount for each kettle, distributor or other bituminous machine that you turn over to a customer. Contact your closest Dow Chemical Company branch for further information.—*Littleford Tatler.*

Lather Helps in Street Cleaning

Instead of washing its streets with ordinary city water, Philadelphia recently tried a lather on them. A gallon of a synthetic detergent called "ultrawet", was added to each 2,000-gal. capacity street flusher. The resulting application left a layer of foam on the streets which persisted for about 30 minutes. Tests showed that the bacterial count on streets washed with this detergent mixture was much less than on streets flushed in the ordinary manner.

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seen by those who employ consultants. For rates, write:

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PUBLIC WORKS Equipment News

Light-Weight Engine-Driven Chain Saw

Though this unit has a 5-hp engine to provide plenty of power for hard and heavy sawing, it weighs only 38 pounds

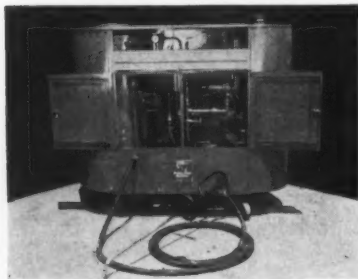


It's easy to cut big trees or logs with the McCulloch power saw.

and can be handled readily by one man. However, with the addition of an end handle, it is also a two-man saw. The blade can be furnished up to 5 ft. long. A 360° swivel is provided so that the blade can saw at any angle, the saw being held in the most comfortable position. Construction is such that a tree with a diameter considerable in excess of the blade length can be cut by making two or more cuts. An excellent booklet is available. *McCulloch Motors Corp., 6101 W. Century Blvd., Los Angeles 45, Calif.*

Steam Cleaner for City and County Garages

This cleaner can be used with natural or artificial gas or oil. It will provide



Turco steam cleaner.

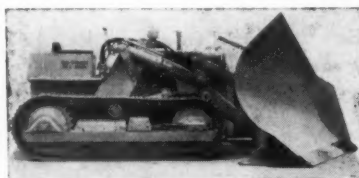
steam cleaning, utilizing up to 180 gals. per hr. of water, or high-pressure rinsing at 240 gph. Pressure of 150 pounds is maintained for either operation. Heating to operating pressure is "instantaneously and thermostatically maintained." Full data from *Turco Products, Inc., 6135 So. Central Ave., Los Angeles, Calif.*

Tandem Rollers

The "Sealcoat" tandem rollers are made in 3-5, 5-8 and 7-10 ton sizes. All of these have single lever hydraulic steering, electric starter, pressure lubrication, roller bearings and foot operated parking and service brake. Because of the small frame clearance, the rollers can work close to the curb lines. *Shaw Sales & Service Co., Los Angeles, Calif.*

Snow Plow and 2-Yd. Snow Bucket

A new V-type hydraulically operated snow plow and a 2-yd. snow bucket have



A-C tractor with 128" snow plow.

been added to the equipment that is available for use with the Allis-Chalmers HD-5 tractor. The V-plow is 116" wide at the ground and 128" wide at the top; the bucket is 96" wide. Both are

interchangeable on the crawler tractor and require no extra equipment for mounting, which is accomplished by removing and replacing four pins. Both the plow and the bucket are made by the *Tractomotive Corp., Deerfield, Ill.*, but are handled through Allis-Chalmers dealers.



Using the Le Roi "31" clay spade.

A Light and Easy-Handling Clay Spade

This new unit weighs only 18 pounds, and is constructed so that it can be handled readily in close quarters; it is only 19" long. A built-in oiling system carries oil from a reservoir in the handle to every working part through the live air stream. This "31 Clay Spade" is made by *Le Roi Co., 1706 South 68th St., Milwaukee 14, Wisc.*



This TD-24 International tractor, with 14-yd. scoop is moving 1200 c.y. in 8 hours on a quarter mile haul, loading both ways, in Douglas Co., Nebr.

Davey Valves Assure PERMANENT PEAK EFFICIENCY

Any compressor will run perfectly when it is new... and will produce its rated air capacity.

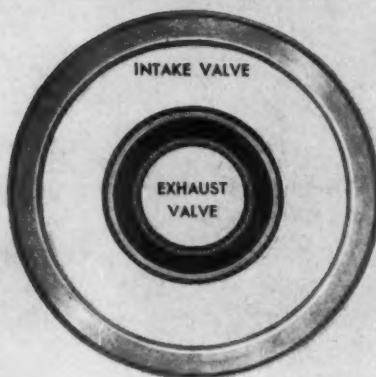
The real test of quality comes with increasing age... the manner in which a unit operates after 5-10-15 years of service. This depends 100% on valve efficiency.

In Davey Compressors permanent peak valve efficiency is the result of providing a ready path for heat removal through aluminum alloys. These alloys transmit heat through their mass three times as fast as cast iron.

Consequently, Davey units operate at constant peak efficiency—longer and more economically.

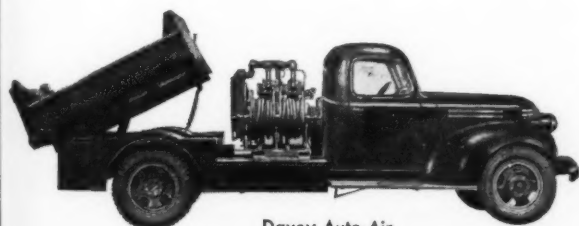
Davey is your best compressor investment—both for today and tomorrow. See your Davey dealer now. Ask him to tell you more about Davey valves—also, how vibration has been "engineered out" of the Davey line.

P & P-318



AFTER 13 YEARS of continuous service, these valves were recently removed from a Davey Compressor.* Their peak-efficiency condition is attested by the absence of carbon or pitting. Note how they have obviously seated perfectly—the complete absence of any signs of leakage... after 13 years.

*Owner's name on request.



Davey Auto-Air
Model 105



Davey Air Chief
Model 210

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DAVEY COMPRESSOR CO.
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Minneapolis-Moline UTIL wheel tractor.

49-hp. 6-Speed Wheel Tractor

With 6 forward speeds, 1.8 to 14.5 mph, this tractor has many uses in construction and maintenance. It can tow rollers on maintenance; pull light scrapers; operate brooms; haul tillers; back-fill trenches and washouts with a bulldozer blade; and handle snow or material with a front-end loader. It is described in Bulletin 1022. Power units are described in Bulls. 1009C and 1013B. Minneapolis-Moline Power Implement Co., Minneapolis 1, Minn.

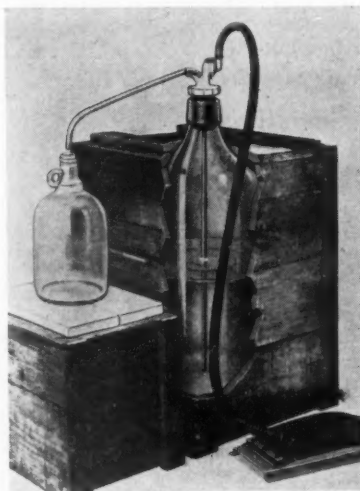
Acid Pump for Hand or Foot Operation

To transfer acids or other liquids from carboys, barrels or drums, a safe hand or foot-operated pump is available. Materials are corrosion resistant; tilting of the container is not necessary. When

the pump is removed from the container, it drains completely. If you have a problem in handling corrosive liquids, write to General Scientific Equipment Co., 2700 W. Huntingdon St., Philadelphia 32, Pa.

Rodent and Bird Nuisance Control

Using a gas six times heavier than air, 6,000 rats were killed on one city



Acid-handling pump.



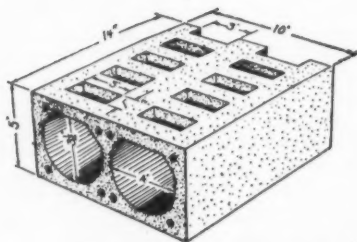
Leaf and litter collector, Good Roads Mach. Co., Minerva, Ohio.

dump; and in another city 1,338 starlings and sparrows were killed in one hour. These records show what can be done in bird and rat eradication by skilled and well directed campaigns. A short folder on ant, rat, starling and sparrow eradication is available. F. G. McCray Co., 3437 East St., Saginaw, Mich. (PO Box 94)

77-Pound Electric Plant

A 4-cycle, engine driven, AC lighting plant generates 350 watts, but weighs only 77 pounds and occupies 2 cu. ft. of space. Such a unit is adaptable for emergency lighting, portable public address systems, job lighting and many other types of work. D. W. Onan & Sons, Inc., Minneapolis 5, Minn.

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Catalogs and Bulletins

Brief and to-the-point mentions:
All are available from the manufacturer or by using the coupon on page 85.

Highway Booklets

Transits & Levels.—A valuable and interesting 56-page book on transits and levels, and attachments; wye and dumpy levels; transit-levels; contractors' levels; convertible levels; protractors; clinometers; quadrant levels, and other equipment. Warren-Knight Co., 136 N. 12th St., Philadelphia 7, Pa.

Signs.—A 44-page catalog of all kinds of signs—street name, city entrance, directional, railroad, traffic, school, warning, brackets, posts and assemblies. Lyle Signs Inc., Minneapolis, Minn.

Hot-Poured Joint Seal.—A 6-page folder describes the "Flintseal" hot-poured joint compound for concrete pavements and shows equipment used for its application. Flintkote Co., 30 Rockefeller Plaza, New York.

Extra Heavy-Duty Motor Grader: A 24-page catalog on Galion's new No. 116 motor grader. It has 100 hp. diesel engine, all-gear tandem drive, full hydraulic control, and six 14 x 24 tires. Many outstanding features of design are

illustrated and described. Galion Iron Works & Mfg. Co., Galion, O.

Bituminous Distributors: Catalog A-48, 8 pages, describes the details of the Kinney bituminous distributors. There are three models, capacity 500 gals. to 3,000 gals. Kinney Mfg. Co., Boston 30, Mass.

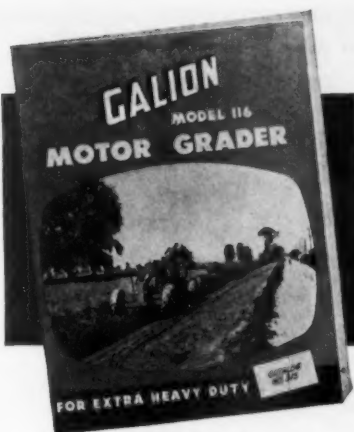
Grit & Cinder Spreader: This describes a hydraulic type of spreader which has controlled speed, density and direction, permitting most effective one-man operation on seal coating, ice control and lime spreading. Hydro Spreader Corp., 247 Madison St., Waukesha, Wis.

Sewerage

Incinerators and Destructors.—Data on sizes and designs of units for general rubbish, garbage and rubbish and garbage alone; also residential units. American Incinerator Corp., 20,216 John R. Street, Detroit 3, Mich.

Screenings, Garbage and Sludge Disposal.—An excellent 8-page bulletin about screenings shredder installations, garbage grinders and their advantages and capacities, and dry sludge shredders with operation data. Gruendler Crusher & Pulverizer Co., 2915 N. Market St., St. Louis 6, Mo.

Kitchen Pulverizers.—This is a garbage grinder for installation in the home



Cover of the Galion No. 116 Motor Grader catalog.

kitchen. In addition to a lot of information on the grinder itself and the advantages (to the housewife) of having such a unit, there are data on how to design a septic tank for use with a pulverator; it isn't necessary to restrict installations to homes having sewers. Given Mfg. Co., 3855 Santa Fe Ave., Los Angeles 11, Calif.

Metal Surface Protection is covered in a 12-page booklet describing properties, advantages, typical uses and application of Dum Dum. Arco Co., 7301 Bessemer Ave., Cleveland 4, O.

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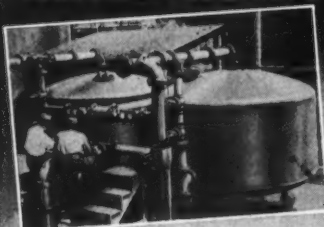


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Just Right for Fast, Small Asphalt Mixes

90. The Foote Kinetic Mixer delivers 3 cu. ft. in 30 seconds. Portable and easily operated. Get Bulletin K-100 from The Foote Co., 1954 State St., Nunda, N. Y.

Flow Meters With Many New Features

91. The new Propello meter, for main-line metering introduces many new features you will want to look into. Send for latest bulletin today. Builders Providence, Inc., 16 Coddling St., Providence 1, R. I.

Aeration and Final Clarification In a Single Tank

92. The "Package Aerifier" for small sewage treatment plants employs the activated sludge process. Ideal for isolated institutions and industrial plants, and communities of 600 to 3500 population. Complete data in bulletin 6631 from Yeomans Brothers Co., 1425 N. Dayton St., Chicago 22, Ill.

Check This Full Line of Sewage Treatment Plant Equipment

93. In a new bulletin describing Hardinge clarifiers and other sanitation equipment all units are clearly illustrated with sectional drawings and photographs. Get bulletin 35-C from Hardinge Co., 240 Arch St., York, Pa.

The Vacuum Filter In Your Home Town

94. That is the title of bulletin F-2005 issued by The Eimco Corp. Data on dewatering sewage sludge by actual installations are included. Write Eimco Corp., Salt Lake City 8, Utah.

Clean Air Is a Must For Activated Sludge Plants

95. Air filters of several types, the "Electro Airmat" (dry type electronic), "Electro Cell" (cell type electronic), "Electro-Matic" self-cleaning, and "Multi-Duty" self-cleaning are described in four bulletins, PW 253, 252, 250 E and 241 A. The first two were brought out in 1946. American Air Filter Co., Inc., 119 Central Ave., Louisville 8, y.

Grading Can Be Faster, Cheaper and Easier

96. You'll like every feature of the Austin-Western 99H Grader. It has all-wheel drive, all-wheel steer, controlled traction, precision shift and a high lift, extreme reach, reversible blade. Get data from Austin-Western Co., Aurora, Ill.

Do Your Trenching The Easy Way

97. Badger self-propelled trench excavators will dig 6 1/2' deep, 7" to 24" wide. Municipalities find the rubber tired model ideal for economical operation. For details write Badger Machine Co., Winona, Minn.

Portable Power Tools For Every Purpose

98. A new, profusely illustrated 22-page catalog gives data and applications of portable power tools, including self-contained gasoline hammer paving breakers, a variety of concrete vibrators and electric hammers, drills and grinders. Get catalog 486 from Syntrol Co., 660 Lexington, Homer City, Pa.

Transits and Levels—Basic Tools for the Engineer

99. Be sure to get the new 9th edition of the Warren-Knight catalog when you need transits, levels and other top-quality surveyors' gear. A full line of surveying instruments is described in their 56-page catalog. Warren-Knight Co., 136 No. 12th St., Philadelphia, Pa.

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Hydraulic Dump Bodies For Every Purpose

15. There's a hydraulic hoist or dump body designed and built to fill your need. Hercules bodies are designed to do a specific job in less time and at a lower cost. Specifications and data on the complete Hercules line available without obligation by writing to Dept. PW, Hercules Steel Products Corp., Galion, Ohio.

Data Book on Universal Concrete Cribbing

21. Shows typical sections for designing walls, pictures many applications, specifications, etc. Get the facts today about this economical reinforced concrete cribbing. Universal Concrete Pipe Co., Dept. PW, 297 So. High St., Columbus 15, Ohio.

Strong, Speedy, Low-Cost Maintainer Has Many Uses

22. BG Maintainer, a powerful speedy, low-priced machine for light road maintenance. Full details in illustrated folder. Huber Mfg. Co., Dept. PW, Marion, Ohio.

Two-Way FM Radio Telephone Equipment for All Departments

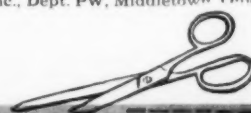
26. For booklet describing and illustrating the Motorola Two-Way Radio Telephone or for specific recommendations concerning your application write to Dept. PW, Motorola, Inc., 4545 Augusta Blvd., Chicago 31, Ill.

Diesel Engines to Help You Build Profits

27. A new 28 page catalog just off the press titled "Superior Stationary Diesel Engines," is packed with facts that will help you build profits. For your copy write to Superior Engine Division, National Supply Company, Springfield, Ohio.

Solve Your Drainage Problems This Easy, Permanent Way

28. Useful new 60 page catalog on standard corrugated pipe, multi-plate pipe and arches and 18 other drainage and related products for culverts, sewers, sub-drains, flood control, airports, water supply and other types of construction. Ask for "Armedco Products for Engineering Construction," Armedco Drainage and Metal Products, Inc., Dept. PW, Middletown Ohio.



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Levels Sidewalks and Curbs Quickly and Easily

29. How the Mud-Jack Method for raising concrete curb, gutter, walls and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a new bulletin by Koehring Company, 3026 W. Concordia Ave., Milwaukee 10, Wis.

Methods of Installing Steel Sheet Piling

30. Illustrated descriptions of both standard and interlock corrugated steel sheet piling of minimum weight, maximum strength, ease of handling with methods of installation are contained in a booklet. If you have a job involving piling write Caine Steel Co., Dept. PW, 1820 No. Central Ave., Chicago 30, Ill.

Speed Maintenance With This Portable Air Compressor

31. LeRoi Portable compressors in sizes from 60 to 500 c.f.m., gasoline or Diesel powered on mountings to fit your special needs. Same manufacturer makes both compressor and engine. Complete bulletin. Write LeRoi Company, 1770 So. 60th St., Milwaukee 14, Wis.

Concrete Forms For Every Need

67. There's a form for your need whether it's concrete pipe for sewer, drain or irrigation; forms for roads, bridges, tunnels or manholes; or a special form problem. For folders telling just what these concrete forms can do for you write Dept. PW, Concrete Forms Corp., 43 Cedar Street, New York 5, N. Y.

The Right Compressor for Every Job

74. This 32-page catalog lists a full line of compressors built in the sizes needed

to efficiently operate modern air tools. Write for Catalog JC-8, Jaeger Machine Co., Columbus 16, Ohio.

SEWAGE DISPOSAL

You Can Get Tanks Built Promptly

2. A new booklet gives not only the salient facts on what Preload Tanks for water works and sewage works are, but how you can get them without waiting. Address: The Preload Companies, 420 Lexington Ave., New York City.

Sewage Plant Gas Storage Facilities

19. General information on estimating figures on Hortonspheres to store surplus gas produced in digesters at sewage disposal plants supplied by Chicago Bridge & Iron Company, 2115 McCormick Bldg., Chicago 4, Ill. Hortonspheres are built in sizes up to 65 ft. diameter for pressures as high as 60 pounds per sq. in. for storage at sewage plants utilizing digester gas.

One-Unit and Two-Unit Vitrified Floor Systems

32. Metro one-unit and two-unit vitrified clay blocks for trickling filter floors are described in illustrated catalog. Includes construction drawings, pictures and complete specifications. Ask for your copy today. The Metropolitan Paving Brick Co., Canton, Ohio.

Non-Corrosive, Long Lasting Low Cost of Sewer Pipe

33. Get this new engineering data on clay pipe for sewers. Withstands acid, alkali and gas attacks indefinitely. Cuts maintenance costs to a minimum. Write Dept. P.W., National Clay Pipe Mfrs., 111 W. Washington St., Chicago 2, Ill.

Save Trucks and Labor In City Rubbish Collection

35. For saving trucks, labor, and time in city rubbish collection get details of the new Dumpster-Kolektor described in literature just published by Dempster Brothers, Inc., 996 Higgins, Knoxville 17, Tenn.

Packaged Sewage Treatment—Just Right for Small Places

36. "Packaged" Sewage Treatment Plants specifically developed for small communities—100 to 3,000 population. Write for full description and actual operating data for this type of plant Chicago Pump Co., 2348 Wolfram St., Chicago 18, Ill.

Need Low-Cost Air For Sewage Treatment?

39. New booklet on Centrifugal and Rotary Positive Blowers engineered to fit your needs: air for activated sludge; constant vacuum for filters; priming centrifugal pumps; measuring sludge gas; water treatment. Write Roots-Connersville Blower Corp., 712 Poplar Ave., Connersville, Ind.

Valuable Booklet on Porous Diffuser Plates and Tubes

40. A valuable booklet on porous diffuser plates and tubes for sewage treatment plant. Covers permeability, porosity, pore size and pressure loss data, with curves. Also information on installation, with sketches and pictures, specifications, methods of cleaning and studies in permeability, 20 pp. illustrated. Write to Norton Company, Dept. P.W., Worcester 6, Mass.

Solve Corrosion Problems With This Special Alloy

41. "Everdur Metal" is title of an 8-page illustrated booklet describing advantages of this corrosion-resisting alloy for sewage treatment equipment, reservoir, and waterworks service. Dept. P.W., the American Brass Co., 25 Broadway, N. Y. C.

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When you buy ARMCRE you buy the complete floor. All ARMCRE blocks are made from fire clay, vitrified and salt glazed. It is a one-piece unit. Three plants insure prompt service.

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Design Details for Sludge Collectors

42. Booklet No. P.W. 1742 on Link-Belt Circuline Collectors contains sanitary engineering data and design details. Catalog No. 1742 on Straightline Collectors, contains layout drawings, illustration pictures and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia 40, Pa.

Ask for This Design Data On Sprinkling Filters

43. Design data on sprinkling filters of Separate Nozzle Field and Common Nozzle Field design as well as complete data on single and twin dosing tanks, and the various siphons used in them, for apportioning sewage to nozzles. Many time-saving charts and tables. Write Pacific Flush Tank Co., Dept. P.W., 4241 Ravenswood Ave., Chicago 13, Ill.

Glazed Clay Blocks for Trickling Filter Underdrains

66. Illustrated bulletin describes the Natco Unifilter block of glazed, hard burned clay for underdraining filter beds. Write National Fireproofing Corp., Pittsburgh 12, Pa., for free copy.

Clean Catch Basins Quicker, Easier

75. Get details and specifications of the new Gar Wood Utility Crane for catch basin cleaning and handling pipe, hydrants or other lifting jobs. Bulletin M-52. Gar Wood Industries, Inc., Wayne, Mich.

For Quicker Garbage Collection

77. Designed to ease the job and last longer under hard usage, carry contents of several home garbage pails in one trip. Reinforced, welded seam steel collection can is available in 16, 20 and 24-gal. capacity. Information from W. T. Pettit & Sons, Inc., 129 So. Center St., Youngstown, Ohio.

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Make fewer trips from
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All About the Aero-Filter System

82. Here is a complete, illustrated treatise on the Halverson-Smith process for sewage and waste treatment. Gives valuable Aero-Filter design information with expected performance data. 16 pages of helpful information. Write Yeomans Brothers Co., 1425 No. Dayton St., Chicago 22, Ill.

STREETS AND HIGHWAYS

Road Protection at Less Cost

16. There's no limit to the jobs you can handle with an Allis-Chalmers Package outfit consisting of the HD-5 Tractor with Tracto-Shovel and Model A-D Motor Grader. For booklets describing and illustrating these and other Allis-Chalmers Equipment write Dept. PW, Allis-Chalmers Tractor Division, Milwaukee 1, Wisc.

Save Time and Labor by Using a "Black-Topper"

46. The Etnyre "Black-Topper" is a bituminous distributor that will save you time and labor on the job. For bulletin giving detail of the accurate, dependable and economical performance of this distributor write Dept. P.W., E. D. Etnyre & Co., Oregon, Ill.

Speed Your Work With These Powerful Motor Graders

48. Two powerful Gallion motor graders designed to answer every requirement for more speed in road, airport, dam and housing construction work are fully described in a folder illustrated with many action pictures. Issued by Gallion Iron Works & Mfg. Co., Gallion, Ohio.

Practical Portable Power Units for Every Need

49. M-M power units with heavy duty engine, positive lubrication, easy servicing, handy controls may be just what you have been looking for. Simple, durable, practical. Get latest bulletin from Dept. P.W., Minneapolis Moline Power Implement Co., Minneapolis 1, Minn.

Here's Your Diesel Tractor!

50. Big 48 page catalog describes and lists many uses for International Diesel Tractors. Write International Harvester Co., Dept. P.W., 180 North Michigan Ave., Chicago 1, Ill.

Need Street, Sewer or Water Castings?

51. Street, sewer and water castings in various styles, sizes and weights. Man-hole covers and steps, inlets and gratings, adjustable curb inlets, water meter covers, cistern and coal hole covers, gutter crossing plates, valve and lamphole covers, etc. Described in catalog PW issued by South Bend Foundry Co., South Bend 23, Ind.

Latest Maintenance Equipment For Blacktop Roads

52. "Blacktop Road Maintenance and Construction Equipment" — Asphalt and tar kettles, flue type kettles, spray attachments, tool heaters, surface heaters, road brooms and rollers. This is modern and up-to-date equipment for blacktop airport and road construction and maintenance. Write for Catalog R. Littleford Bros., Inc., 452 East Pearl St., Cincinnati 2, Ohio.



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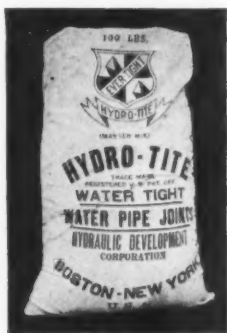
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Works: West Medford Station, Boston, Mass.

Adhesive Joint Sealers and How They Are Applied

68. A new folder—just off the press—describes Flintseal Hot-Poured Joint-Sealing compound and illustrates joint preparation, material preparation and application of the compound. Series of pictures shows steps in application—plowing out old material from joint, wire brushing to clean old material off concrete, use of compressed air to clean dirt and dust out of joint, picture of completed joint, etc. On request from The Flintkote Co., Dept. PW, 30 Rockefeller Plaza, New York 20, N. Y.

SNOW FIGHTING

For High-Speed Snow Removal

44. "Frink One-Way Sno-Plows" is a four page catalog illustrating and describing 5 models of One-Way Blade Type Sno-Plows for motor trucks from 1½ up to 8 tons capacity. Interchangeable with V Sno-Plow, Frink Sno-Plows, Inc., Clayton, 1000 Islands, N. Y.

End Dangerous Ice Hazards

86. Ice prevention on highways, streets and airport runways with Sterling "Auger Action" Rock Salt is described in illustrated bulletin PW issued by International Salt Co., Inc., Scranton, Pa.

All of These Booklets Are FREE, and Many Are of Great Value. To Order Those You Need in Your Work Use the Coupon on Page 85.

WATER WORKS

Double-Duty Softener And Dealkalizer

8. A 12-page booklet describes how this double-duty Zeo-Karb softener and dealkalizer works and how it is applied to various industrial problems. Ask for Bulletin 2418. The Permutit Company, 330 West 42nd St., New York 18, N. Y.

Long Distance Recording of Level-Pressure-Flow

9. Be sure to get Bulletin 358 on the "Chronoflo Telemeter" that brings accurate records of flow, level, pressure, temperature, gate positions, weight, etc., from widely scattered locations to a central operating point. Widely used in Water and Sewage plants. Write Builders-Providence, Inc., 16 Coddling St., Providence 1, R. I.

A New Answer to Some Old Waterworks Problems

12. That is what they call "Hypo-Chlorination of Water," a 48-page illustrated discussion of this live subject, in a booklet packed with helpful information. For your copy, address: Mathieson Chemical Corp., Dept. PW, 60 E. 42nd St., New York 17, N. Y.

All About Cement-Mortar Lining of Water Mains

13. Here, in a really beautiful booklet, is practically everything you need to know about this method of lining mains in place—the needs, methods, and results that will interest you. Centriline Corp., Dept. PW, 140 Cedar St., New York 6, N. Y.

How Elevated Water Tanks Can Save on Operating Costs

14. Beautiful new booklet on Horton elevated steel water tanks suggests ways to reduce pumping costs, increase capacity of systems, maintain uniform pressure, etc. Illustrates 7 models of welded, ellipsoidal-bottom, elevated steel tanks in full color. Write Chicago Bridge & Iron Co., 2115 McCormick Bldg., Chicago 4.

Do Your Water Mains Need Cleaning?

38. Literature on Flexible method of cleaning water mains any size from 2" to 72", giving full details and list of nearest representatives in all parts of country. Address: Flexible Underground Pipe Cleaning Co., 9059 Venice Blvd., Los Angeles, Calif.

Eliminate Taste and Odor From Your Water

53. Technical pub. No. P.W. 213 issued by Wallace & Tiernan Co., Inc., Newark 1, N. J., describes in detail taste and odor control of water with BREAK-POINT Chlorination. Send free to any operator requesting it.

Here's Data on All Swimming Pool Needs

55. Well illustrated bulletin describes Filters, Water Softeners, Hydrogen Ion Plants and Complete Equipment for Swimming pools, etc. Copy sent on request by Dept. PW., Chemical Equipment Co., 223 Center Street, Los Angeles 54, Calif.

Have You a Water Conditioning Problem?

56. Installation-tested equipment for complete municipal and industrial systems or individual units. Illustrated and described in latest booklets from Dept. P.W., American Wells Works, Aurora, Ill.

Chem-O-Feeders for Automatic Chemical Feeding

60. For chlorinating water supplies, sewage plants, swimming pools and feeding practically any chemical used in sanitation, treatment of water and sewage. Flow of water controls dosage of chemical; reagent feed is immediately adjustable. Starts and stops automatically. Literature from % Proportioners, Inc., 96 Coddling St., Providence 1, R. I.

What You Should Know About Meter Setting and Testing Equipment

61. The most complete catalog we have seen on setting and testing equipment for water meters—exquisitely printed and illustrated 40-page booklet P.W. You should have a copy. Ask: Ford Meter Box Co., Wabash, Ind.

Find Buried Pipe

62. Finding buried pipe is easy to do with the new Featherweight Goldak Pipe Locator. An easy-to-read illustrated bulletin tells the full story quickly. Address: The Goldak Co., 1544 W. Glenoaks Blvd., Glenade 1, Calif.

How to Use Alum For Coagulation

70. Alum for coagulation in both sewage and water plants is the subject of literature now available from Dept. PW, General Chemical Division, 40 Rector St., New York 6, N. Y.

88 Page Book Helps Solve Water Problems

71. pH and Chlorine Control. A discussion of pH control and description of comparators, chlorimeters and similar devices. An 88 page booklet. W. A. Taylor & Co., 7304 York Road, Baltimore 4, Md.

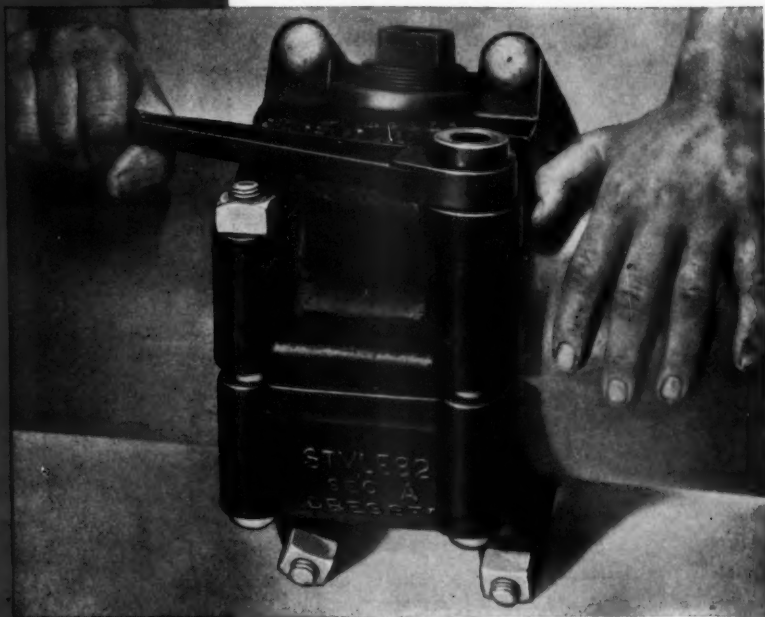
How to Estimate Quantity Of Joint Compound Needed

87. The uses of Tegul-Minerallead for bell and spigot pipe and G-K Sewer joint compound are described in a 16-page illustrated booklet issued by Atlas Mineral Products Co., Mertztown, Pa. Includes useful tables for estimating quantities needed.

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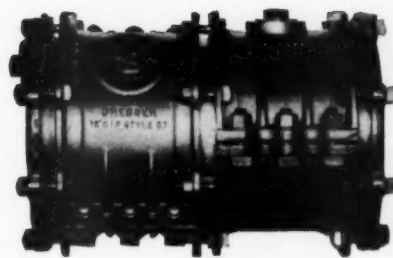
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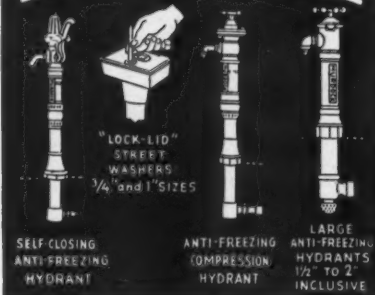
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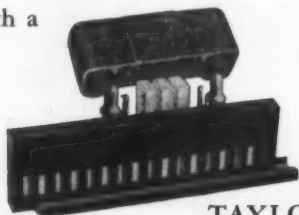
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Jobs for Engineers

The Union County Mosquito Control Commission, Elizabeth, N. J., has a vacancy for Superintendent of Mosquito Control. The pay will range from \$4200 up to about \$5500, depending on several factors.

The publishers of an engineering magazine (not PUBLIC WORKS) are looking for an engineer with editorial or writing experience, and will pay from \$4000 to \$5000, depending on background. Letters to the Editor of Public Works will be forwarded promptly.

Personal and Business

James B. Cook, formerly assistant to the vice-president of Proportioners, has joined C. I. Thornburg Co., Inc., suppliers of water works and industrial equipment, Huntington, W. Va.

Benjamin A. Whisler, Head of the Department of Civil Engineering, Pennsylvania State College, has been made consulting editor for the International Textbook Co. civil engineering texts.

Charles Starling has been made Southeast District Engineer for Inflico, with headquarters at Decatur, Ga., replacing Fred Eidsness, who goes to Philadelphia.

Palmer Filter Equipment Co., Erie, Pa., has appointed Alhydro, Inc., Baltimore, Md., as distributing agents for Palmer filter bed agitators and Anthra-filt filter medium. Alhydro, Inc., also handles the Floc Producer; offices are at 516 N. Charles St.

Modern Garbage Equipment for New York and Baltimore

Gar Wood Industries, Inc., Wayne, Mich., have sold 87 Load-Packers to Baltimore, Md., and have started delivery of 200 such units to New York City. The equipment going to Baltimore will be mounted on Reo, GMC and Federal chassis, and those to New York on GMC.

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NOTICE TO BIDDERS: Sealed proposals, addressed to the Mayor and City Council of the City of El Paso, Texas, for the construction of seventeen (17) retention dams and a storm water conduit system will be received until 10:00 A.M., October 14, 1948, at the office of the City Clerk, El Paso, Texas.

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